COHERENT®

Diode Laser Modules and Pattern Generators

2011 Catalog

Superior Reliability & Performance

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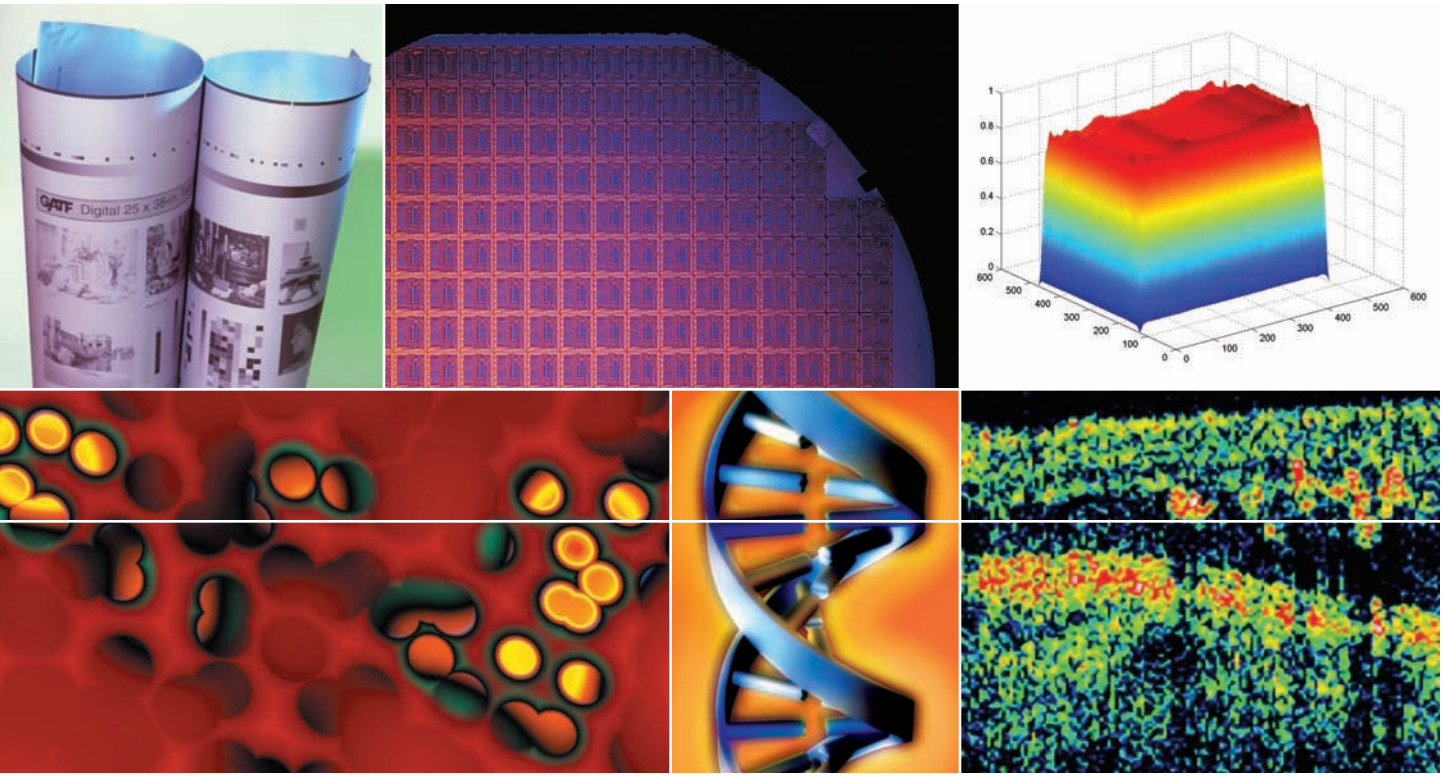
Diode Laser Modules and Systems

Introduction



Coherent's Laser Diode Modules combine the technology of the diode laser with quality optics, sophisticated electronics and rugged modular packaging to provide a reliable laser source suitable to a variety of application needs.

Applications:

Confocal Microscopy
Flow Cytometry
Medical Alignment
3D Contour Mapping
Genomics
High Speed Industrial Inspection
Homeland Security
Environmental Monitoring
Machine Vision

Diode Laser Modules and Pattern Generators

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The Lasiris Advantage

Introduction

The Coherent Lasiris advantage
Coherent's world-renowned Lasiris™ laser's transforms the familiar laser dot into a wide range of structured light patterns including single and multiple laser lines with uniformity down to ±15%. Straight laser lines are projected by allowing one dimension of light to fan out while maintaining tight control over the other, resulting in a uniform sheet-of-light.

What distinguishes the Lasiris family of laser's from conventional lasers (with cylindrical optics) is the evenness of the illumination pattern. Lasiris lasers incorporate a patented optical laser line generator that eliminates Gaussian distribution of the light, resulting in the most uniform laser lines on the market. The design provides superior quality light patterns while avoiding the intricacies of installation alignment and detector calibration.

Increase the Performance and Reliability of your Application

Make full use of available power
The Lasiris non-gaussian line shows a sharp cut-off at the ends, enabling the detector to utilize the full length of the line of light instead of only the center region. All the power of a Lasiris laser is put to use.

Simple no-nonsense calibration
Detector calibrations are easier because of the uniform intensity profile along a Lasiris line length.

Industrial-grade protection
In addition to quality optical components, Lasiris lasers are protected from over-voltage, over-temperature, reverse-polarity, and ESD electrostatic discharge, complete with a full 2-year guarantee for selected lasers.

Eliminate Laser Safety Problems

Eye-safe lasers
Since there is no hot spot and the laser energy is better spread along a Lasiris laser pattern, the safety rating of the structured light projector can be kept at the class II level for most model where other lasers cannot.

Find the Solution that is Right for You

Over 48,000 off-the-shelf standard solutions
With so many standard possibilities as well as custom and OEM capabilities, whether you need a larger housing, a specific wavelength, a shorter cable, or a completely new type of laser, do not hesitate to test our skills!

Diode Laser Modules and Systems

Reliable Solutions for all Your Photonics Needs

Quality solutions
Based on size, reliability and cost, diode lasers from Coherent are the first choice for single-mode diode lasers (<100 mW) for scientific, OEM, medical or industrial applications. With the highest quality design and superior beam quality, our high-performance diode laser modules can meet your exact needs.

Patented AlignLock technology
Only Coherent allows the laser beam to be simultaneously collimated and aligned. Other diode laser manufacturers can do one or the other, but not both. Patented AlignLock™ lets you know that the pointing stability and thermal/mechanical design is world class (US 5,111,476 and US 5,121,188).

Rock-solid potting
Diode modules are engineered for protection from mechanical shock, optimized for thermal conductivity and vibrationally damped, so factory alignment is rock-solid and reliable.

Electronic protection
Our diode laser modules are protected from electrostatic discharge (ESD) and are fully shielded with reverse polarity protection, meeting MIL-STD 1686B/Level 2 requirements, up to 4000 volts. With Radius™ and CUBE™ lasers, protection exceeds Level 4 ESD at 15,000 volts.

Beam performance
Diode laser modules are smaller, require less power, generate less heat and have longer lifetimes than other laser sources. Our laser modules are configured as elliptical beams, circular beams or line generators with optional adjustable focus to increase or decrease the divergence.

Temperature, wavelength and power
Temperature fluctuations can adversely affect diode lasers. For example, at 50°C typical red diode lifetimes are approximately 6,000 hours. However, when the diode is actively cooled, the expected lifetime becomes >30,000 hours. Both the Radius and CUBE systems offer an internal thermal-electric cooler (TEC) drive for complete thermal management and optimization of the diode laser's reliability and performance.

All Coherent diode modules feature constant power drive. Internal photodiodes provide for a closed loop power drive so that the output power is constant over temperature and lifetime. Beware of other modules with only constant-current drive, which have the disadvantage of continual power loss over the life of the laser. Coherent laser modules provide stable power—always.

We also offer the only ultra-low-noise (ULN) diode laser modules, which feature no mode-hop noise and no warm-up time, with RMS noise levels of ≤0.06% over temperature and lifetime of the module (bandwidth <10 MHz). ULN lasers are ideal for instrumentation and particle counting applications, providing the maximum system dynamic range so you can reliably count even the smallest particle.

See our website
For product specification pages, product operation manuals, technical materials, competitive comparisons and prices, please visit the **Diode Modules** category at **www.Coherent.com**.

Wavelength and Power Choices
Powers range from less than 1 mW up to 100 mW. Shorter wavelength blue/violet diodes provide output from 370 nm to 440 nm. For visual alignment systems, 635 nm is the wavelength of choice, while for instrumentation and measurement needs, wavelengths from 635 nm to 830 nm are available.

CUBE

Diode Laser Systems

CUBE™ lasers are high-performance, full-feature diode laser systems. Each contains a laser head, power supply, cable, and control box. The system is designed to be one of the easiest to set-up and use. The CUBE delivers the most power, stability and performance—in the smallest package—with the best value.

A complete system

All CUBE electronics, optics and thermal management are built into the head. Every system includes a full-feature cable that lets you access all the features inside the CUBE. A compact 6V power supply, a control box for safety features, and USB software to drive the laser are also included.

The CUBE

The CUBE offers you full control. First, the CUBE can work as a CW laser with a convenient auto-start mode. The CUBE also offers a digital input connector, located on the back panel, to drive the laser up to 150 MHz with a TTL source. Users can then command the CUBE to change the power level, either through the RS-232 or USB. For analog modulation the CUBE offers a separate analog input, located on the front panel of the control box, which allows variable power control up to 350 kHz.

For high dynamic range the digital modulation and analog power controls offer modulation depths greater than 250:1. For maximum flexibility in your application the CUBE also offers mode selection for constant-power or constant-current drive. The versatility of the CUBE includes CW, digital control, analog control and variable power operation.

With all the electronics inside the head, the control and instrumentation are available through the 15-pin connector on the laser's back panel. The interlock input, laser enable input, or auto-start mode provide control. Instrumentation on the CUBE gives you a laser-ready output, laser output power (actual laser power in an analog signal), baseplate temperature and general fault conditions. Every CUBE laser has a built-in photo-diode that measures the laser final output power. The photodiode enables closed-loop power stability and allows you to know the laser power via the analog output or computer. CUBE lasers are also equipped with dual-temperature probes, which control thermal management and display both the diode and baseplate temperature. Overall, the CUBE offers complete control and instrumentation without the need for additional equipment.

CUBE

Diode Laser Systems

Key Features

- Compact and modular OEM design
- Superior beam quality
- Minimal laser output RMS noise
- Complete CDRH safety features for scientific and laboratory use
- TEC temperature-stabilized and conductively cooled through baseplate
- Analog and digital modulation
- USB and RS-232

Multiple CUBE Connections

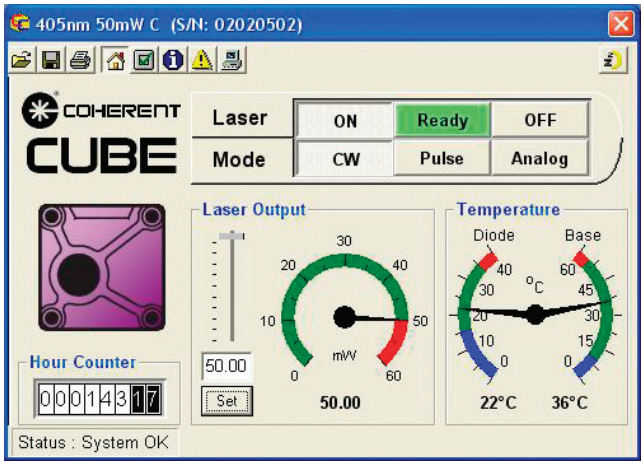
CUBE lasers make it possible to configure multiple lasers into the same computer. Using the USB can allow up to 16 CUBE lasers to be connected on a single computer. The CUBE connection software will display each laser on its own control panel. The CUBE also has intelligence, allowing it to report which version (375 nm, 405 nm, etc.) is on the port, so you can easily drive multiple lasers simultaneously.

The Software

The CUBE includes a full-feature software interface for Windows 2000 or Windows XP with multiple pages of status, control and configuration options. The home page includes an instrumentation dashboard for power, current, diode temperature and baseplate temperature. Buttons control laser on, mode, and power. A counter changes every one hundredth of an hour to show the actual 'on' time of the laser. The CUBE connection software makes it easy to use with help screens that feature descriptions, graphics and other assistance.

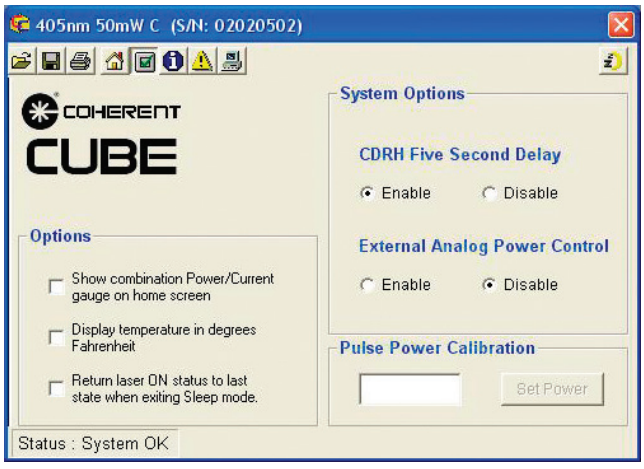
Home Screen

The Home Screen allows for computer control of the CUBE. Control laser On/Off, set laser power and change operating modes.



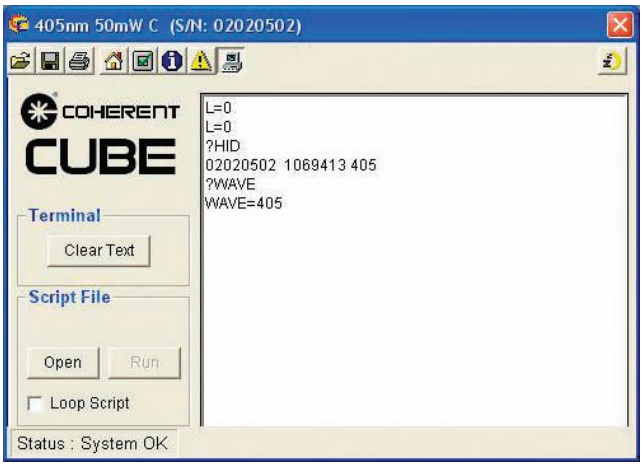
Options Screen

The Options Screen allows for configuration choices on settings such as laser current display, 5-second delay, external analog power and laser diode temperature.



CUBE

Diode Laser Systems

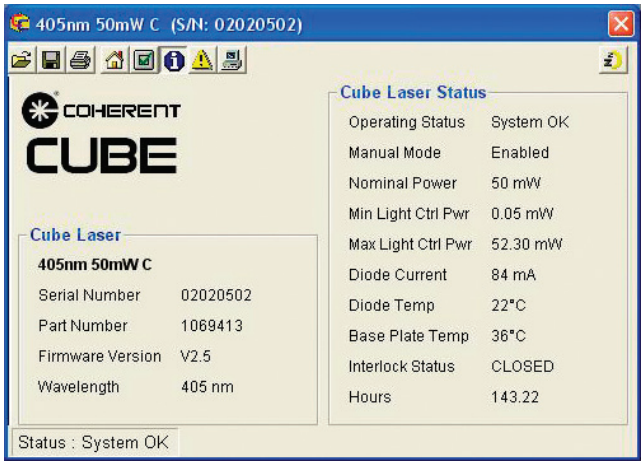


Terminal Screen

The Terminal Screen allows for direct communication to the CUBE through the command line. Scripts can also be executed and set to loop. The Terminal Screen can accelerate the learning curve for laser control in embedded applications.

Status Screen

The Status Screen shows the details of the laser from serial number to operating hours. A separate Fault Screen also shows any faults from an interlock fault to over-temperature.



The Control Box

To comply with the CDRH safety requirements for a Class IIIb laser, the CUBE includes both the shutter on the front of the laser and a separate control box. The control box includes the key switch that activates the laser, a five-second power-on delay, an interlock RCA jack on the back panel and a laser emission indicator. (For countries requiring a second laser emission indicator, a second lamp that connects to the cable I/O connector can be purchased separately [part no. 1079150].) The control box also offers a front panel BNC connection for the analog power control, which can use an external voltage source (0-5V) to change the CUBE's output power.

The Cable

The CUBE's full-feature cable allows access and control to all its capabilities. The cable offers four separate lines: for power, I/O, control box, and RS-232. The I/O cable is labeled with the signal's name, pin number, and description so you can easily connect to the eight (8) separate laser control/instrumentation signals. For example, connect a voltmeter between pin numbers 2 and 7 and instantly the meter is now reporting laser power with 2V equivalent to 100% laser output power. Or connect the convenient Second Emission Lamp [part no. 1079150] as an additional safety measure.

The RS-232 cable can plug the laser directly into a computer for remote control and instrumentation.

The control box is conveniently connected to allow required safety features and analog power control from the front panel BNC. Also included with each CUBE is a USB cable, which allows the laser to plug directly into any Windows* 2000 or Windows XP system.

The Power Supply

The CUBE, which has been designed for easy integration into your system with a single power supply input, can accept from 4.8V to 6.5VDC.

Control and I/O

CUBE systems offer an extensive list of commands that can be executed through the RS-232 or USB. Please visit www.coherent.com and download the CUBE User Manual or the CUBE help screens for a full description of the commands and I/O.

CUBE

Diode Laser Systems

Every CUBE system comes standard with a compact 6VDC supply with a power switch and an LED. The power supply is equipped with an IEC320 universal input, which allows most computer-style power cords to be easily used with your country's power (U.S. -style power cord is included).

Reliability
The CUBE is fully protected from electro-static discharge (ESD) to Level 4 standards and is also equipped with temperate shutdown systems to protect the laser diode. The diode and optics are temperature-controlled through a TEC to provide the optimal performance and maximum lifetime. Reliability is the priority—within every CUBE is a computer processor controlling all the aspects of the laser drive, thermal systems and protection measures.

The Extras
For even simpler set-up and integration, a heat sink accessory provides a convenient 2.5" beam height and a universal bolt pattern for easy mounting—with the beam axis traveling directly down a row of holes on the laser table. For high-temperature applications a fan inside the heat sink provides additional cooling. Please note that the CUBE comes standard with the laser head, control box, cables, power supply, manual, software, and a U.S. power cord. The heat sink, however, is sold separately.

Overall, CUBE lasers can give you more powerful and efficient ways to use diode laser light in the fields of bioinstrumentation, particle counting, confocal microscopy, high-throughput screening, or general laboratory work.

CUBE

Diode Laser Systems

System Specifications

CUBE	375-16C	405-50C	405-100C
Part Number	1112774	1174298	1142279
Wavelength[1] (nm)	375	405	405
Output Power[2] (mW)	16	50	100
Beam Diameter at 1/e² (mm)(typical)	1.1	1.4	1.4
Beam Divergence (mrad)(typical)	0.5	0.4	0.4
M² (ModeMaster beam quality)[3]	≤1.3	≤1.3	≤1.2
Beam Asymmetry[3]		<1:1.2	
Laser Drive Modes		Digital, Analog and PC Control	
Digital Modulation			
Maximum Bandwidth (MHz)		150	
Rise Time (10% to 90%) (nsec)		<2	
Fall Time (10% to 90%) (nsec)		<2	
Modulation Depth (extinction ratio)		>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation			
Maximum Bandwidth (kHz)	70	350	350
Rise or Fall Time (10% to 90%) (µsec)	<5	<1	<1
Modulation Depth (extinction ratio)		>10,000:1	
Laser Enable Control Input			
Maximum Bandwidth (kHz)		130	
Rise or Fall Time (10% to 90%) (µsec)		<1	
Modulation Depth (extinction ratio)		∞, complete On/Off	
RMS Noise			
20 Hz to 10 MHz	≤0.15%		≤0.1%
10 MHz to 500 MHz		<1.0%	
Long-Term Power Stability (8 hours)		<±2%	
Warm-Up Time (minutes)		<5	
Spatial Mode (far field)		TEM00	
Pointing Stability (µrad/°C)		<6	
Polarization Ratio[4]		Min. 100:1, Vert. ±5°	
Static Alignment Tolerances[5]			
Beam Position (mm)		<1	
Beam Angle (mrad)		<5	
CDRH Laser Classification		Class IIIb	
ESD Protection[6]		Level 4	

[1] Laser-to-laser tolerance. All lasers ±5 nm except CUBE 640-40 with 635 to 642 nm range, CUBE 640-100 with 635 to 644 nm range, CUBE 660 with 652 to 665 nm range, and CUBE 685, 730 and 785 with ±10 nm.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% power. Recommended power range is 70% to 100% power.
[3] M² and Beam Asymmetry measured with ModeMaster with 90/10 clip levels.
[4] Polarization measurement is max./min. power with polarizer at 32 in. from laser with LM-2 power head at 37 in. from laser.
[5] Static alignment tolerances are relative to the right bottom edge (in beam direction).
[6] Electro-Static Discharge Standard IEC 1000-4-2, 1995.

CUBE

Diode Laser Systems

System Specifications

CUBE	445-40C	488-50C
Part Number	1069418	1174040
Wavelength[1] (nm)	445	488
Output Power[2] (mW)	40	50
Beam Diameter at 1/e² (mm)(typical)	1.1	1.3
Beam Divergence (mrad)(typical)	0.6	
M² (ModeMaster beam quality)[3]	≤1.2	
Beam Asymmetry[3]	<1:1.2	
Laser Drive Modes	Digital, Analog and PC Control	
Digital Modulation		
Maximum Bandwidth (MHz)	125	
Rise Time (10% to 90%) (nsec)	<2	
Fall Time (10% to 90%) (nsec)	<3	
Modulation Depth (extinction ratio)	>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation		
Maximum Bandwidth (kHz)	350	
Rise or Fall Time (10% to 90%) (µsec)	<1	
Modulation Depth (extinction ratio)	>10,000:1	
Laser Enable Control Input		
Maximum Bandwidth (kHz)	130	
Rise or Fall Time (10% to 90%) (µsec)	<1	
Modulation Depth (extinction ratio)	∞, complete On/Off	
RMS Noise		
20 Hz to 10 MHz	≤0.1%	
10 MHz to 500 MHz	<1.0%	
Long-Term Power Stability (8 hours)	<±2%	
Warm-Up Time (minutes)	<5	
Spatial Mode (far field)	TEM00	
Pointing Stability (µrad/°C)	<6	
Polarization Ratio[4]	Min. 100:1, Vert. ±5°	
Static Alignment Tolerances[5]		
Beam Position (mm)	<1	
Beam Angle (mrad)	<5	
CDRH Laser Classification	Class IIIb	
ESD Protection[6]	Level 4	

[1] Laser-to-laser tolerance. All lasers ±5 nm except CUBE 640-40 with 635 to 642 nm range, CUBE 640-100 with 635 to 644 nm range, CUBE 660 with 652 to 665 nm range, and CUBE 685, 730 and 785 with ±10 nm.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% power. Recommended power range is 70% to 100% power.
[3] M² and Beam Asymmetry measured with ModeMaster with 90/10 clip levels.
[4] Polarization measurement is max./min. power with polarizer at 32 in. from laser with LM-2 power head at 37 in. from laser.
[5] Static alignment tolerances are relative to the right bottom edge (in beam direction).
[6] Electro-Static Discharge Standard IEC 1000-4-2, 1995.

CUBE

Diode Laser Systems

System Specifications

CUBE	635-30E	640-40C	640-100C
Part Number	1069410	1069417	1150205
Wavelength[1] (nm)	635	640	640
Output Power[2] (mW)	30	40	100
Beam Diameter at 1/e² (mm)(typical)	1 x 3.8	1	1
Beam Divergence (mrad)(typical)	0.8 x 0.3	1	1
M² (ModeMaster beam quality)[3]		≤1.2	
Beam Asymmetry[3]	1:3.8	<1:1.2	<1:1.2
Laser Drive Modes		Digital, Analog and PC Control	
Digital Modulation			
Maximum Bandwidth (MHz)		150	
Rise Time (10% to 90%) (nsec)		<2	
Fall Time (10% to 90%) (nsec)		<2	
Modulation Depth (extinction ratio)		>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation			
Maximum Bandwidth (kHz)		350	
Rise or Fall Time (10% to 90%) (µsec)		<1	
Modulation Depth (extinction ratio)		>10,000:1	
Laser Enable Control Input			
Maximum Bandwidth (kHz)		130	
Rise or Fall Time (10% to 90%) (µsec)		<1	
Modulation Depth (extinction ratio)		∞, complete On/Off	
RMS Noise			
20 Hz to 10 MHz		≤0.1%	
10 MHz to 500 MHz		<1.0%	
Long-Term Power Stability (8 hours)		<±2%	
Warm-Up Time (minutes)		<5	
Spatial Mode (far field)		TEM00	
Pointing Stability (µrad/°C)		<6	
Polarization Ratio[4]		Min. 100:1, Vert. ±5°	
Static Alignment Tolerances[5]			
Beam Position (mm)		<1	
Beam Angle (mrad)		<5	
CDRH Laser Classification		Class IIIb	
ESD Protection[6]		Level 4	

[1] Laser-to-laser tolerance. All lasers ±5 nm except CUBE 640-40 with 635 to 642 nm range, CUBE 640-100 with 635 to 644 nm range, CUBE 660 with 652 to 665 nm range, and CUBE 685, 730 and 785 with ±10 nm.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% power. Recommended power range is 70% to 100% power.
[3] M² and Beam Asymmetry measured with ModeMaster with 90/10 clip levels.
[4] Polarization measurement is max./min. power with polarizer at 32 in. from laser with LM-2 power head at 37 in. from laser.
[5] Static alignment tolerances are relative to the right bottom edge (in beam direction).
[6] Electro-Static Discharge Standard IEC 1000-4-2, 1995.

CUBE

Diode Laser Systems

System Specifications

CUBE	660-60C	660-100C	685-40C
Part Number	1094060	1130061	1184303
Wavelength[1] (nm)	660	660	685
Output Power[2] (mW)	60	100	40
Beam Diameter at 1/e² (mm)(typical)	1.4	1	1
Beam Divergence (mrad)(typical)	0.6	1	1
M² (ModeMaster beam quality)[3]		≤1.2	
Beam Asymmetry[3]		<1:1.2	
Laser Drive Modes		Digital, Analog and PC Control	
Digital Modulation			
Maximum Bandwidth (MHz)	150	150	150
Rise Time (10% to 90%) (nsec)	<2	<2	<2
Fall Time (10% to 90%) (nsec)	<2	<2	<2
Modulation Depth (extinction ratio)		>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation			
Maximum Bandwidth (kHz)		350	
Rise or Fall Time (10% to 90%) (µsec)		<1	
Modulation Depth (extinction ratio)		>10,000:1	
Laser Enable Control Input			
Maximum Bandwidth (kHz)		130	
Rise or Fall Time (10% to 90%) (µsec)		<1	
Modulation Depth (extinction ratio)		∞, complete On/Off	
RMS Noise			
20 Hz to 10 MHz		≤0.1%	
10 MHz to 500 MHz		<1.0%	
Long-Term Power Stability (8 hours)		<±2%	
Warm-Up Time (minutes)		<5	
Spatial Mode (far field)		TEM00	
Pointing Stability (µrad/°C)		<6	
Polarization Ratio[4]		Min. 100:1, Vert. ±5°	
Static Alignment Tolerances[5]			
Beam Position (mm)		<1	
Beam Angle (mrad)		<5	
CDRH Laser Classification		Class IIIb	
ESD Protection[6]		Level 4	

[1] Laser-to-laser tolerance. All lasers ±5 nm except CUBE 640-40 with 635 to 642 nm range, CUBE 640-100 with 635 to 644 nm range, CUBE 660 with 652 to 665 nm range, and CUBE 685, 730 and 785 with ±10 nm.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% power. Recommended power range is 70% to 100% power.
[3] M² and Beam Asymmetry measured with ModeMaster with 90/10 clip levels.
[4] Polarization measurement is max./min. power with polarizer at 32 in. from laser with LM-2 power head at 37 in. from laser.
[5] Static alignment tolerances are relative to the right bottom edge (in beam direction).
[6] Electro-Static Discharge Standard IEC 1000-4-2, 1995.

CUBE

Diode Laser Systems

System Specifications

CUBE	730-30C	785-40C
Part Number	1178855	1069416
Wavelength[1] (nm)	730	785
Output Power[2] (mW)	30	40
Beam Diameter at 1/e² (mm)(typical)	1.2	1.2
Beam Divergence (mrad)(typical)	0.9	1
M² (ModeMaster beam quality)[3]	≤1.2	
Beam Asymmetry[3]	<1:1.2	
Laser Drive Modes	Digital, Analog and PC Control	
Digital Modulation		
Maximum Bandwidth (MHz)	150	
Rise Time (10% to 90%) (nsec)	<2	
Fall Time (10% to 90%) (nsec)	<2	
Modulation Depth (extinction ratio)	>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation		
Maximum Bandwidth (kHz)	350	
Rise or Fall Time (10% to 90%) (µsec)	<1	
Modulation Depth (extinction ratio)	>10,000:1	
Laser Enable Control Input		
Maximum Bandwidth (kHz)	130	
Rise or Fall Time (10% to 90%) (µsec)	<1	
Modulation Depth (extinction ratio)	∞, complete On/Off	
RMS Noise		
20 Hz to 10 MHz	≤0.1%	
10 MHz to 500 MHz	<1.0%	
Long-Term Power Stability (8 hours)	<±2%	
Warm-Up Time (minutes)	<5	
Spatial Mode (far field)	TEM00	
Pointing Stability (µrad/°C)	<6	
Polarization Ratio[4]	Min. 100:1, Vert. ±5°	
Static Alignment Tolerances[5]		
Beam Position (mm)	<1	
Beam Angle (mrad)	<5	
CDRH Laser Classification	Class IIIb	
ESD Protection[6]	Level 4	

[1] Laser-to-laser tolerance. All lasers ±5 nm except CUBE 640-40 with 635 to 642 nm range, CUBE 640-100 with 635 to 644 nm range, CUBE 660 with 652 to 665 nm range, and CUBE 685, 730 and 785 with ±10 nm.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% power. Recommended power range is 70% to 100% power.
[3] M² and Beam Asymmetry measured with ModeMaster with 90/10 clip levels.
[4] Polarization measurement is max./min. power with polarizer at 32 in. from laser with LM-2 power head at 37 in. from laser.
[5] Static alignment tolerances are relative to the right bottom edge (in beam direction).
[6] Electro-Static Discharge Standard IEC 1000-4-2, 1995.

CUBE

Diode Laser Systems

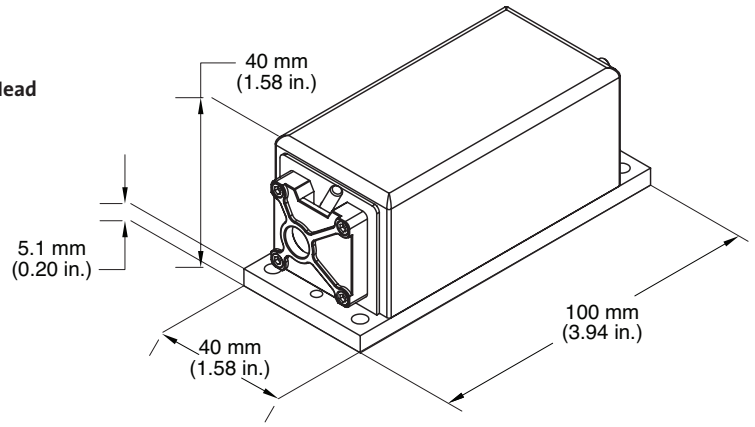
Utility and Environmental Requirements

Laser Head Operating Voltage	+4.8 to 6.5 VDC
Laser Head Operating Current	<2.5 amps
Baseplate Temperature Range[1]	+10° to 50°C (50° to 122°F)
Maximum Heat Dissipation of Head (baseplate at 50°C)	13W
Storage Temperature	-20° to 60°C (-4° to 140°F)
Power Supply[2] (included)	
Operating Voltage[3]	100 to 240 VAC, 50 to 60 Hz
Power Consumption	<15W

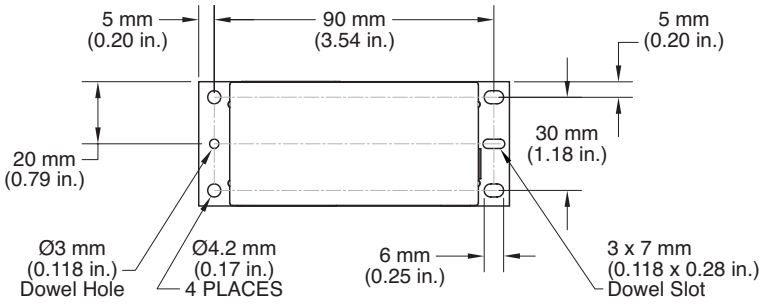
	Dimensions (L xW x H)	Weight
Laser Head	100 x 40 x 40 mm (3.9 x 1.6 x 1.6 in.)	0.3 kg (0.7 lbs.)
Control Box	138 x 62 x 26 mm (5.4 x 2.4 x 1.1 in.)	0.12 kg (0.3 lbs.)
Power Supply	87 x 47 x 32 mm (3.4 x 1.9 x 1.3 in.)	0.22 kg (0.5 lbs.)
Head Cable	254 to 406 mm (10 to 18 in.)	0.08 kg (0.2 lbs.)
USB Cable	1.8m (6 ft.)	0.1 kg (0.2 lbs.)
Heat Sink (optional)	127 x 66 x 44 mm (5 x 2.6 x 1.74 in.)	0.4 kg (0.9 lbs.)

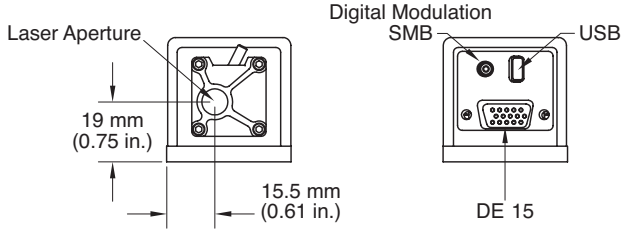
[1] Non-condensing with laser diode TEC at set point of 22°C.
[2] On-off power switch and LED included in cord to laser head.
[3] System includes USA-type power cord, IEC320 input connection.

CUBE Laser Head



Top View





Front View **Rear View**

CUBE

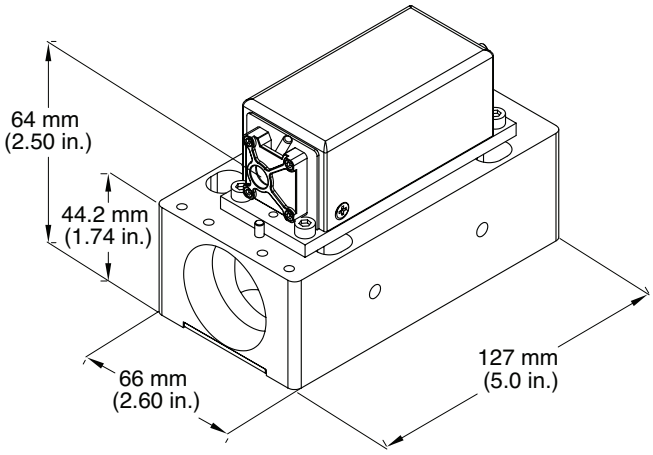
Diode Laser Systems

CUBE Accessories

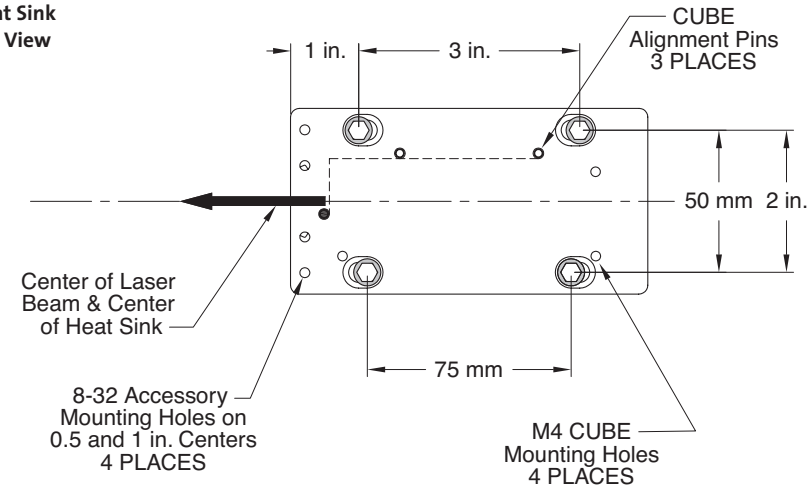
1073840	CUBE Heat Sink Accessory	CUBE heat sink with fan, 127 x 66 x 44 mm
1079150	CUBE 2nd Emission Lamp	CDRH lamp for laser emission. Connects to CUBE I/O cable.
1072166	*CUBE Interface Cable	CUBE to control box, I/O, RS-232 and power
1072454	*CUBE Power Supply, 6 VDC, 2.5 amps	IEC320 input, 110V/220V, switch and LED
1108906	*CUBE USB Cable, 6 ft. (1.8m)	USB standard to mini for CUBE
1039966	* Control Box, CDRH, Keyswitch, Interlock	Control box for CUBE lasers. Included box, key, interlock RCA and cable.
1080090	Cable, Extension, DB-9 M/F, 6 ft. (1.8m)	Extension cable to extend control box or RS-232. M-F, DB-9.
1040408	* Plug, RCA	Interlock RCA plug for control box, non-shorted
1079890	*CUBE Manual and Software	CUBE user manual and software CD for Windows 2000** and Windows XP**
6005-0059	*Power Cord, USA, 6 ft. (1.8m)	Power cord, USA plug style to IEC320
1116779	CUBE Heat Sink Right Angle	CUBE right angle mount, 102 x 47 x 44 mm, same beam position with horizontal polarization

* Included free with every CUBE system.
** Windows 2000 and Windows XP are registered trademarks of Microsoft Corporation.

CUBE Heat Sink



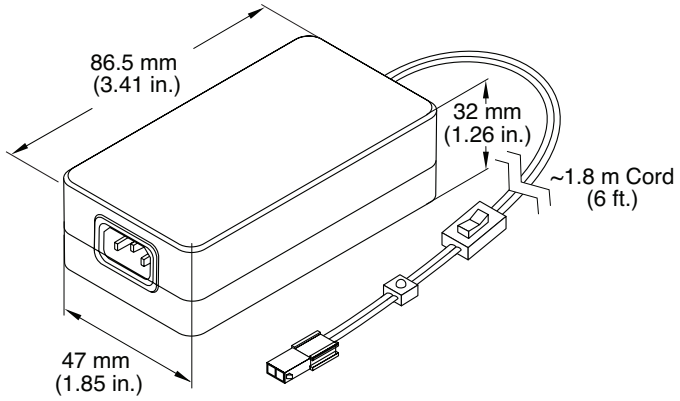
Heat Sink Top View



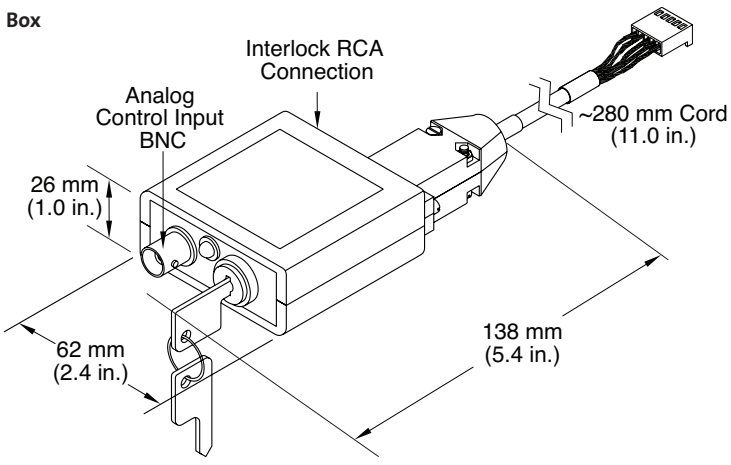
CUBE

Diode Laser Systems

CUBE
Power Supply



CUBE
Control Box



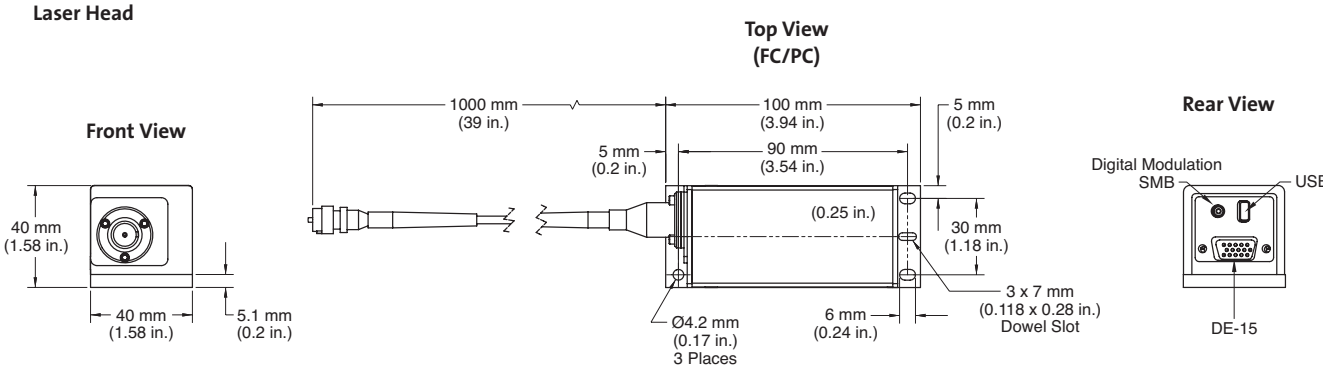
CUBE FP

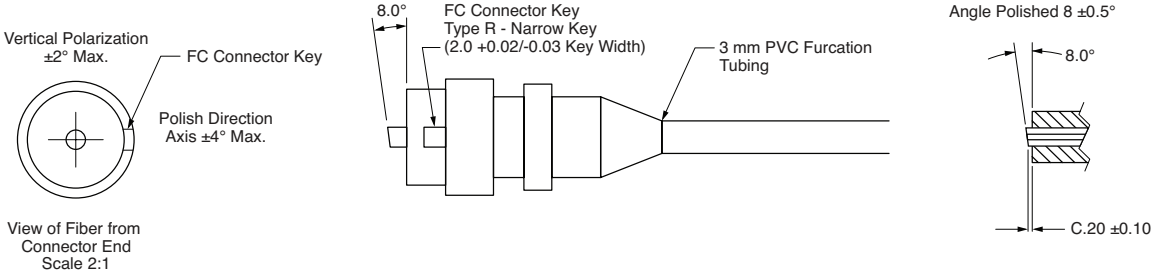
Diode Laser System

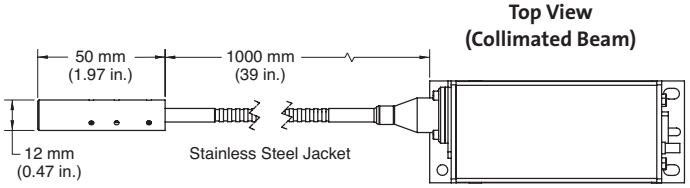
Key Features

- Permanent fiber attachment – constant power without adjustments
- Compact and modular OEM design
- Complete CDRH safety features for scientific and laboratory use
- TEC temperature-stabilized and conductively cooled through baseplate
- Analog and digital modulation
- USB and RS-232

CUBE FP
Laser Head







CUBE FP

Diode Laser System

System Specifications

CUBE FP	405-50FP	405-50FP
Part Number	1139602	1139601
Output from Fiber	FC/APC (8° angled)[6]	Collimated Beam
Fiber Cable Type	3 mm PVC	Stainless Steel
Fiber Cable Length (m)(minimum)	1	1
Wavelength[1] (nm)	405	405
Output Power[2] (mW)	50	50
Beam Diameter (1/e²)(mm)(typical)	-	1
Beam Divergence (mrad)(typical)	-	1
Fiber Numerical Aperture (NA)(1/e²)	0.05	-
Mode-field Diameter (µm)(typical)	3.5	
M² (ModeMaster beam quality)	≤1.1	
Beam Asymmetry	≤1:1.1	
Laser Drive Modes	Digital, Analog and PC Control	
Digital Modulation		
Maximum Bandwidth (MHz)	150	
Rise Time (10% to 90%)(nsec)	<2	
Fall Time (10% to 90%)(nsec)	<2	
Modulation Depth (extinction ratio)	>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation		
Maximum Bandwidth (kHz)	350	
Rise or Fall Time (10% to 90%)(µsec)	<1	
Modulation Depth (extinction ratio)	>10,000:1	
Laser Enable Control Input		
Maximum Bandwidth (kHz)	130	
Rise or Fall Time (10% to 90%)(µsec)	<1	
Modulation Depth (extinction ratio)	∞, complete On/Off	
RMS Noise		
20 Hz to 10 MHz	<0.2%	
10 MHz to 500 MHz	<1.0%	
Power Stability (8 hours, ±3°C)	≤±2%	
Long-Term Output Power Average	≤5%/1000 hrs.	
Warm-Up Time (minutes)	<5	
Spatial Mode (far field)	TEM00	
Pointing Stability (µrad/°C)	-	<6
Polarization Ratio[3]	Minimum 100:1	
Tolerances[4]		
Beam Position (mm)	-	≤0.5
Beam Angle (mrad)	-	≤15
CDRH Laser Classification	Class IIIb	
ESD Protection[5]	Level 4	

[1] Laser-to-laser tolerance. CUBE 640-30 has center wavelength range of 635 nm to 642 nm, CUBE 640-75 with 635 nm to 644 nm range, CUBE 660 with 652 nm to 665 nm range, CUBE 405, 445 and 488 with ±5 nm range.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% to 110% power. Recommended power range is 70% to 100% power. Factory setting 100% to 110% of power specification.
[3] Polarization measurement is max./min. power with polarizer at 32 cm from laser with LM-2 power head at 37 cm from laser.
[4] Static alignment tolerances are relative to center of output beam aperture.
[5] Electro-Static Discharge Standard IEC 1000-4-2, 1995.
[6] Fiber FC/APC connector output not compatible for patchcord-to-patchcord connection.

CUBE FP

Diode Laser System

System Specifications

CUBE FP	445-25FP	445-25FP
Part Number	1169225	1169224
Output from Fiber	FC/APC (8° angled)[6]	Collimated Beam
Fiber Cable Type	3 mm PVC	Stainless Steel
Fiber Cable Length (m)(minimum)	1	1
Wavelength[1] (nm)	445	445
Output Power[2] (mW)	25	25
Beam Diameter (1/e²)(mm)(typical)	-	1
Beam Divergence (mrad)(typical)	-	1
Fiber Numerical Aperture (NA)(1/e²)	0.05	-
Mode-field Diameter (µm)(typical)	3.5	
M² (ModeMaster beam quality)	≤1.1	
Beam Asymmetry	≤1:1.1	
Laser Drive Modes	Digital, Analog and PC Control	
Digital Modulation		
Maximum Bandwidth (MHz)	125	
Rise Time (10% to 90%)(nsec)	<2	
Fall Time (10% to 90%)(nsec)	<3	
Modulation Depth (extinction ratio)	>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation		
Maximum Bandwidth (kHz)	350	
Rise or Fall Time (10% to 90%)(µsec)	<1	
Modulation Depth (extinction ratio)	>10,000:1	
Laser Enable Control Input		
Maximum Bandwidth (kHz)	130	
Rise or Fall Time (10% to 90%)(µsec)	<1	
Modulation Depth (extinction ratio)	∞, complete On/Off	
RMS Noise		
20 Hz to 10 MHz	<0.2%	
10 MHz to 500 MHz	<1.0%	
Power Stability (8 hours, ±3°C)	≤±2%	
Long-Term Output Power Average	≤5%/1000 hrs.	
Warm-Up Time (minutes)	<5	
Spatial Mode (far field)	TEM00	
Pointing Stability (µrad/°C)	-	<6
Polarization Ratio[3]	Minimum 100:1	
Tolerances[4]		
Beam Position (mm)	-	≤0.5
Beam Angle (mrad)	-	≤15
CDRH Laser Classification	Class IIIb	
ESD Protection[5]	Level 4	

[1] Laser-to-laser tolerance. CUBE 640-30 has center wavelength range of 635 nm to 642 nm, CUBE 640-75 with 635 nm to 644 nm range, CUBE 660 with 652 nm to 665 nm range, CUBE 405, 445 and 488 with ±5 nm range.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% to 110% power. Recommended power range is 70% to 100% power. Factory setting 100% to 110% of power specification.
[3] Polarization measurement is max./min. power with polarizer at 32 cm from laser with LM-2 power head at 37 cm from laser.
[4] Static alignment tolerances are relative to center of output beam aperture.
[5] Electro-Static Discharge Standard IEC 1000-4-2, 1995.
[6] Fiber FC/APC connector output not compatible for patchcord-to-patchcord connection.

CUBE FP

Diode Laser System

System Specifications

CUBE FP	488-30FP	488-30FP
Part Number	1169223	1169222
Output from Fiber	FC/APC (8° angled)[6]	Collimated Beam
Fiber Cable Type	3 mm PVC	Stainless Steel
Fiber Cable Length (m)(minimum)	1	1
Wavelength[1] (nm)	488	488
Output Power[2] (mW)	30	30
Beam Diameter (1/e²)(mm)(typical)	-	1
Beam Divergence (mrad)(typical)	-	1
Fiber Numerical Aperture (NA)(1/e²)	0.05	-
Mode-field Diameter (µm)(typical)	3.5	
M² (ModeMaster beam quality)	≤1.1	
Beam Asymmetry	≤1:1.1	
Laser Drive Modes	Digital, Analog and PC Control	
Digital Modulation		
Maximum Bandwidth (MHz)	125	
Rise Time (10% to 90%)(nsec)	<2	
Fall Time (10% to 90%)(nsec)	<3	
Modulation Depth (extinction ratio)	>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation		
Maximum Bandwidth (kHz)	350	
Rise or Fall Time (10% to 90%)(µsec)	<1	
Modulation Depth (extinction ratio)	>10,000:1	
Laser Enable Control Input		
Maximum Bandwidth (kHz)	130	
Rise or Fall Time (10% to 90%)(µsec)	<1	
Modulation Depth (extinction ratio)	∞, complete On/Off	
RMS Noise		
20 Hz to 10 MHz	<0.2%	
10 MHz to 500 MHz	<1.0%	
Power Stability (8 hours, ±3°C)	≤±2%	
Long-Term Output Power Average	≤5%/1000 hrs.	
Warm-Up Time (minutes)	<5	
Spatial Mode (far field)	TEM00	
Pointing Stability (µrad/°C)	-	<6
Polarization Ratio[3]	Minimum 100:1	
Tolerances[4]		
Beam Position (mm)	-	≤0.5
Beam Angle (mrad)	-	≤15
CDRH Laser Classification	Class IIIb	
ESD Protection[5]	Level 4	

[1] Laser-to-laser tolerance. CUBE 640-30 has center wavelength range of 635 nm to 642 nm, CUBE 640-75 with 635 nm to 644 nm range, CUBE 660 with 652 nm to 665 nm range, CUBE 405, 445 and 488 with ±5 nm range.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% to 110% power. Recommended power range is 70% to 100% power. Factory setting 100% to 110% of power specification.
[3] Polarization measurement is max./min. power with polarizer at 32 cm from laser with LM-2 power head at 37 cm from laser.
[4] Static alignment tolerances are relative to center of output beam aperture.
[5] Electro-Static Discharge Standard IEC 1000-4-2, 1995.
[6] Fiber FC/APC connector output not compatible for patchcord-to-patchcord connection.

CUBE FP

Diode Laser System

System Specifications

CUBE FP	640-30FP	640-30FP	640-75FP	640-75FP
Part Number	1139604	1139603	1169221	1169220
Output from Fiber	FC/APC (8° angled)	Collimated Beam	FC/APC (8° angled)	Collimated Beam
Fiber Cable Type	3 mm PVC	Stainless Steel	3 mm PVC	Stainless Steel
Fiber Cable Length (m)(minimum)	1	1	1	1
Wavelength[1] (nm)	640	640	640	640
Output Power[2] (mW)	30	30	75	75
Beam Diameter (1/e²)(mm)(typical)	-	1	-	1
Beam Divergence (mrad)(typical)	-	1	-	1
Fiber Numerical Aperture (NA)(1/e²)	0.09	-	0.09	-
Mode-field Diameter (µm)(typical)	4.5	-	4.5	-
M^2 (ModeMaster beam quality)	≤1.1			
Beam Asymmetry	≤1:1.1			
Laser Drive Modes	Digital, Analog and PC Control			
Digital Modulation				
Maximum Bandwidth (MHz)	150			
Rise Time (10% to 90%)(nsec)	<2			
Fall Time (10% to 90%)(nsec)	<2			
Modulation Depth (extinction ratio)	>1,000,000:1 at 0 Hz, >250:1 at 150 MHz			
Analog Modulation				
Maximum Bandwidth (kHz)	350			
Rise or Fall Time (10% to 90%)(µsec)	<1			
Modulation Depth (extinction ratio)	>10,000:1			
Laser Enable Control Input				
Maximum Bandwidth (kHz)	130			
Rise or Fall Time (10% to 90%)(µsec)	<1			
Modulation Depth (extinction ratio)	∞, complete On/Off			
RMS Noise				
20 Hz to 10 MHz	<0.2%			
10 MHz to 500 MHz	<1.0%			
Power Stability (8 hours, ±3°C)	≤±2%			
Long-Term Output Power Average	≤3%/1000 hrs.			
Warm-Up Time (minutes)	<5			
Spatial Mode (far field)	TEM00			
Pointing Stability (µrad/°C)	-	<6	-	<6
Polarization Ratio[3]	Minimum 100:1			
Tolerances[4]				
Beam Position (mm)	-	≤0.5	-	≤0.5
Beam Angle (mrad)	-	≤15	-	≤15
CDRH Laser Classification	Class IIIb			
ESD Protection[5]	Level 4			

[1] Laser-to-laser tolerance. CUBE 640-30 has center wavelength range of 635 nm to 642 nm, CUBE 640-75 with 635 nm to 644 nm range, CUBE 660 with 652 nm to 665 nm range, CUBE 405, 445 and 488 with ±5 nm range.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% to 110% power. Recommended power range is 70% to 100% power. Factory setting 100% to 110% of power specification.
[3] Polarization measurement is max./min. power with polarizer at 32 cm from laser with LM-2 power head at 37 cm from laser.
[4] Static alignment tolerances are relative to center of output beam aperture.
[5] Electro-Static Discharge Standard IEC 1000-4-2, 1995.

CUBE FP

Diode Laser System

System Specifications

CUBE FP	660-75FP	660-75FP
Part Number	1151423	1151412
Output from Fiber	FC/APC (8° angled)	Collimated Beam
Fiber Cable Type	3 mm PVC	Stainless Steel
Fiber Cable Length (m)(minimum)	1	1
Wavelength[1] (nm)	660	660
Output Power[2] (mW)	75	75
Beam Diameter (1/e²)(mm)(typical)	-	1
Beam Divergence (mrad)(typical)	-	1
Fiber Numerical Aperture (NA)(1/e²)	0.09	-
Mode-field Diameter (µm)(typical)	4.5	
M² (ModeMaster beam quality)	≤1.1	
Beam Asymmetry	≤1:1.1	
Laser Drive Modes	Digital, Analog and PC Control	
Digital Modulation		
Maximum Bandwidth (MHz)	150	
Rise Time (10% to 90%)(nsec)	<2	
Fall Time (10% to 90%)(nsec)	<2	
Modulation Depth (extinction ratio)	>1,000,000:1 at 0 Hz, >250:1 at 150 MHz	
Analog Modulation		
Maximum Bandwidth (kHz)	350	
Rise or Fall Time (10% to 90%)(µsec)	<1	
Modulation Depth (extinction ratio)	>10,000:1	
Laser Enable Control Input		
Maximum Bandwidth (kHz)	130	
Rise or Fall Time (10% to 90%)(µsec)	<1	
Modulation Depth (extinction ratio)	∞, complete On/Off	
RMS Noise		
20 Hz to 10 MHz	<0.2%	
10 MHz to 500 MHz	<1.0%	
Power Stability (8 hours, ±3°C)	≤±2%	
Long-Term Output Power Average	≤3%/1000 hrs.	
Warm-Up Time (minutes)	<5	
Spatial Mode (far field)	TEM00	
Pointing Stability (µrad/°C)	-	<6
Polarization Ratio[3]	Minimum 80:1	
Tolerances[4]		
Beam Position (mm)	-	≤0.5
Beam Angle (mrad)	-	≤15
CDRH Laser Classification	Class IIIb	
ESD Protection[5]	Level 4	

[1] Laser-to-laser tolerance. CUBE 640-30 has center wavelength range of 635 nm to 642 nm, CUBE 640-75 with 635 nm to 644 nm range, CUBE 660 with 652 nm to 665 nm range, CUBE 405, 445 and 488 with ±5 nm range.
[2] Output power is variable via RS-232, USB or analog interface from 1% to 100%. Specifications are valid for 100% to 110% power. Recommended power range is 70% to 100% power. Factory setting 100% to 110% of power specification.
[3] Polarization measurement is max./min. power with polarizer at 32 cm from laser with LM-2 power head at 37 cm from laser.
[4] Static alignment tolerances are relative to center of output beam aperture.
[5] Electro-Static Discharge Standard IEC 1000-4-2, 1995.

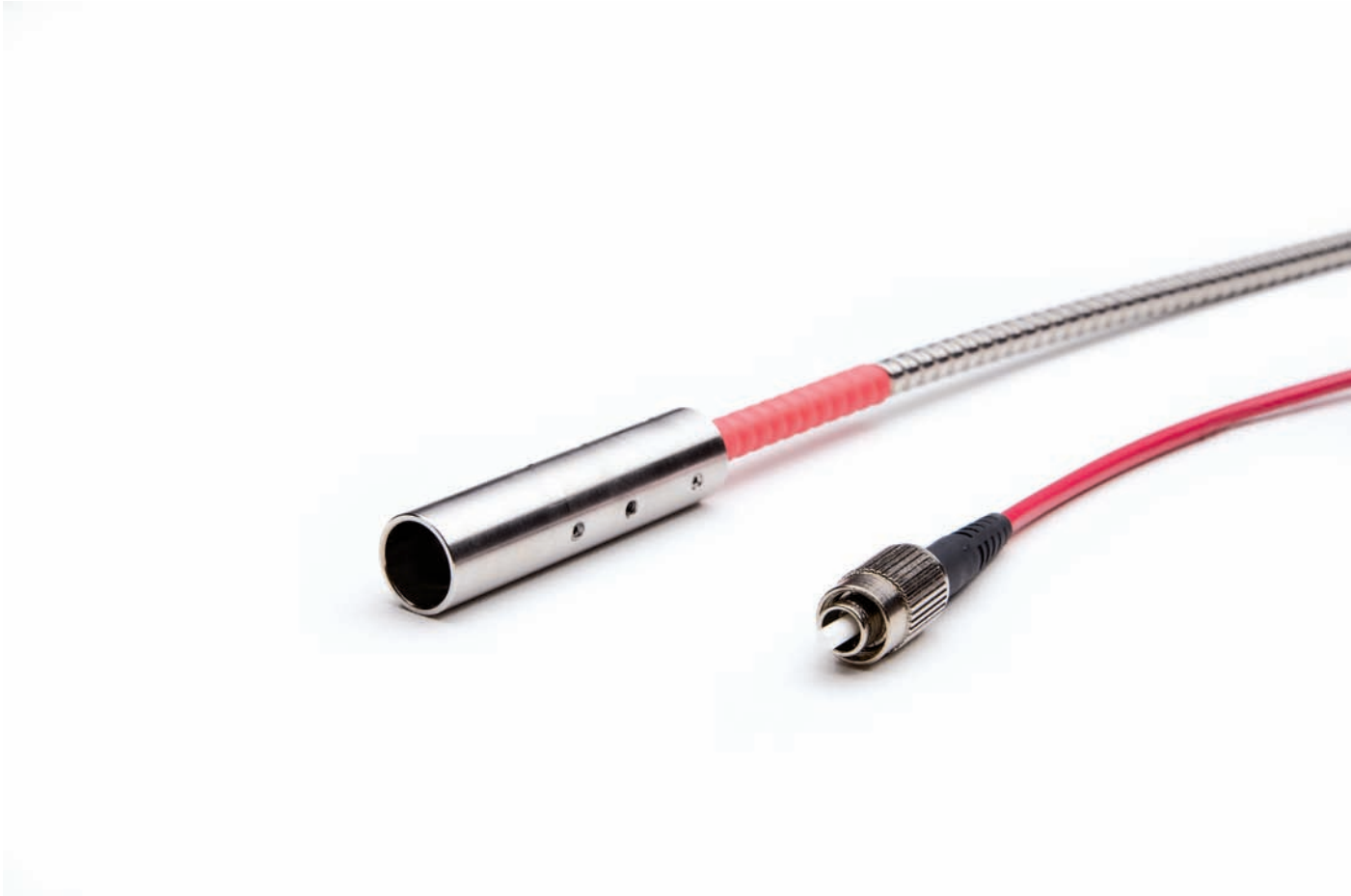
CUBE FP

Diode Laser System

Utility and Environmental Requirements

Laser Head Operating Voltage	+4.8 to 6.5 VDC	
Laser Head Operating Current	<2.5 amps	
Baseplate Temperature Range[1]	+10° to 50°C (50° to 122°F)	
Maximum Heat Dissipation of Head (baseplate at 50°C)	13W	
Storage Temperature	-20° to 60°C (-4° to 140°F)	
Power Supply[2] (included)		
Operating Voltage[3]	100 to 240 VAC, 50 to 60 Hz	
Power Consumption	<15W	
	Dimensions (L xW x H)	**Weight**
Laser Head	100 x 40 x 40 mm (3.9 x 1.6 x 1.6 in.)	0.3 kg (0.7 lbs.)
Laser Head with Minimum Fiber Bend Radius	203 mm (8.0 in.)	
Fiber Tensile Load (max.)		1 kg (2.2 lbs.)
Fiber Minimum Bend Radius	51 mm (2.0 in.)	
Control Box	138 x 62 x 26 mm (5.4 x 2.4 x 1.1 in.)	0.12 kg (0.3 lbs.)
Power Supply	87 x 47 x 32 mm (3.4 x 1.9 x 1.3 in.)	0.22 kg (0.5 lbs.)
Head Cable	254 to 406 mm (10 to 18 in.)	0.08 kg (0.2 lbs.)
USB Cable	1.8 m (6 ft.)	0.1 kg (0.2 lbs.)
Heat Sink (optional - sold separately)	127 x 66 x 44 mm (5 x 2.6 x 1.74 in.)	0.4 kg (0.9 lbs.)

[1] Non-condensing with laser diode TEC at set point of 22°C.
[2] On-off power switch and LED included in cord to laser head.
[3] System includes USA-type power cord, IEC320 input connection.



CUBE FP

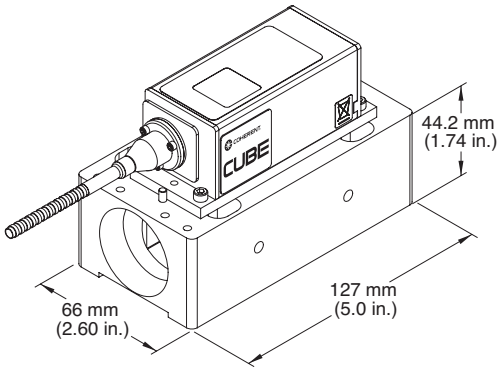
Diode Laser System

CUBE Accessories

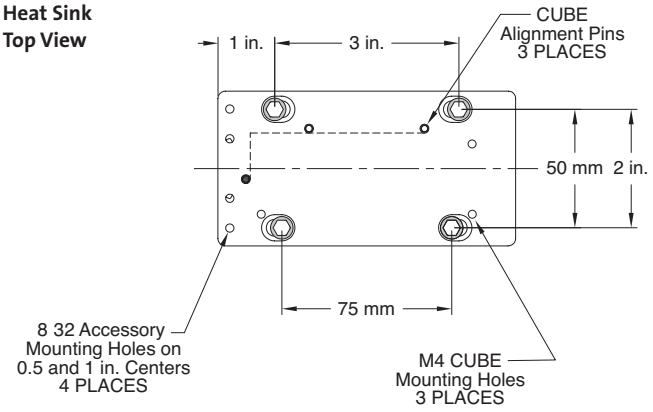
1073840	CUBE Heat Sink Accessory	CUBE heat sink with fan, 127 x 66 x 44 mm
1079150	CUBE 2nd Emission Lamp	CDRH lamp for laser emission. Connects to CUBE I/O cable.
1072166	*CUBE Interface Cable	CUBE to control box, I/O, RS-232 and power
1072454	*CUBE Power Supply, 6 VDC, 2.5 amps	IEC320 input, 110V/220V, switch and LED
1108906	*CUBE USB Cable, 6 ft. (1.8m)	USB standard to mini for CUBE
1039966	* Control Box, CDRH, Keyswitch, Interlock	Control box for CUBE lasers. Included box, key, interlock RCA and cable.
1080090	Cable, Extension, DB-9 M/F, 6 ft. (1.8m)	Extension cable to extend control box or RS-232. M-F, DB-9.
1040408	* Plug, RCA	Interlock RCA plug for control box, non-shorted
1150553	*CUBE FP Manual	CUBE FP user manual and software CD for Windows 2000** and Windows XP**
6005-0059	*Power Cord, USA, 6 ft. (1.8m)	Power cord, USA plug style to IEC320

* Included free with every CUBE system.
** Windows 2000 and Windows XP are registered trademarks of Microsoft Corporation.

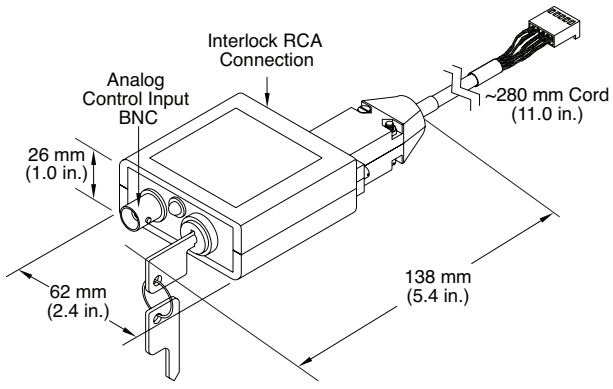
CUBE Heat Sink



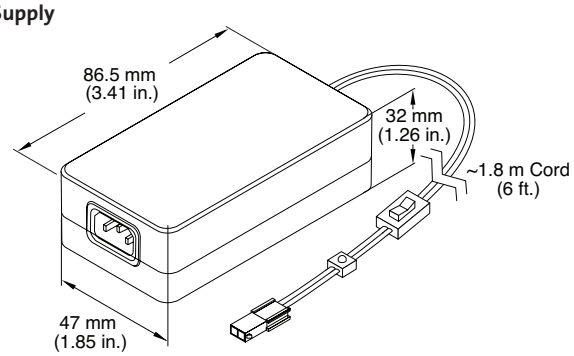
Heat Sink Top View



CUBE Control Box



CUBE Power Supply



Radius

Diode Laser Systems

Radius lasers are full-featured, high-performance, CW diode laser systems that include a laser head, power supply and optional control box. Designed for convenient mounting into a HeNe laser holder for fast and simple integration, they deliver power, stability and performance in a complete package with the best value.

Adjustable Focus Radius
These lasers allow faster and easier system integration. When optimizing the beam for best focus or fiber launch, the adjustable focus eliminates the need for an expensive beam expander. Instead, a tool (included) adjusts the beam divergence through the front shutter port.

The optional control box—with a key-switch, 5-second power-on delay, emission indicator and interlock—allows the system to comply with CDRH safety regulations. The control box plugs into the side port of the Radius.

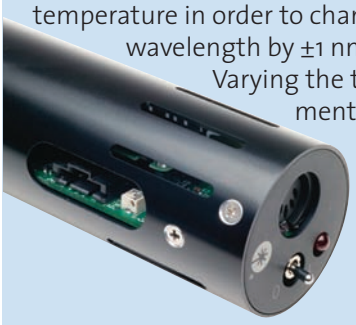
The side port can also be used to modulate the laser on-and-off as fast as 5 Hz (100 Hz for the Radius 635) through the interlock control input. This modulation can be used to extend the lifetime of the diode by enabling the laser to be 'on' only when needed—while the thermal system remains constant for improved stability.

Mounted on a large TEC, the diode laser and optics remain at a constant temperature of 22°C. A heat sink with an internal fan removes the heat. The closed-loop, constant temperature keeps the wavelength constant, minimizes mode-hops and maintains power stability.

Extra Photodiode
The Radius 405-30EP features an extra photodiode that provides the best power stability over time.

Circular Beam
The patented micro-lens technology and aspherical optics of the Radius 635-25 circularize the output of the diode laser to better than 80% with a typical M^2 <1.2.

Side Port
Using a side port, users can vary the diode temperature in order to change the center wavelength by ±1 nm (635 nm diodes). Varying the temperature adjustment also allows users to avoid modehops, thus providing the maximum coherence length.



Radius

Diode Laser Systems

Key Features

- HeNe cylindrical-style package
- All-in-one design: Optics, electronics and TEC
- Adjustable beam option
- ESD protection
- Internal cooling fan
- CDRH Class IIIb safety compliance option
- Constant power CW

	Radius	405-50	635-25	635-25E
System Specifications	Wavelength (nm)	405 ±5	635 +7/-2	635 +7/-2
	Power (mW)	50	25	25
	Max. Modulation Frequency (Hz)	5	100	100
	RMS Noise (10 Hz to 10 MHz)	<0.5%	<0.5%	<0.5%
	Power Stability (8 Hours)	<5%	<2%	<2%
	Adjustable Beam Focus (Divergence)	Yes	No	Yes
	Static Alignment Tolerances[1]	<5 mrad (angle)	<15 mrad (angle)	<5 mrad (angle)
	Polarization (Horizontal)	>100:1	>100:1	>100:1
	CDRH Class	Class IIIb	Class IIIb	Class IIIb
	Spot Size (mm)(typical)	4.7 x 1.6	1	1.5 x 4.6
	Divergence (mrad)(typical)	0.2 x 0.3	1.3	0.5 x 0.2
	Part Number for System with Control Box included	1064507	1051385	–
	Part Number for System without Control Box[2]	1064506	1008053	1149819
Laser Head Specifications	Laser Drive	CW, Constant Power		
	Pointing Stability	<6 µrad/°C		
	Beam Spatial Mode (Far Field)	TEM00		
	ESD Protection[4]	Level 4		
	Dimensions (Diameter x Length)	44.5 x 218 mm (1.75 x 8.6 in.)		
	Optional Control Box (L x W x H)	138 x 62 x 26 mm (5.4 x 2.4 x 1 in.)		
	Ambient Temperature Range for Operation	10°C to 40°C (50°F to 104°F)[5]		
	Storage Temperature	-20°C to 60°C (-4°F to 140°F)		
	Maximum Heat Load from Laser Head	10W, typical 3W		
Power Supply Specifications	Power Supply included with System	Yes		
	Weight	570 g (1.25 lbs.)		
	Dimensions (L x W x H)	146 x 76 x 43 mm (5.8 x 3.0 x 1.7 in.)		
	Output to Laser Head	+5VDC, -5VDC, +12VDC		
	Cord Length to Laser Head	120 cm (48 in.)		
	AC Input Voltage	100 to 240VAC, 47 to 63 Hz[6]		
	AC Input Power	<15W		

[1] Static alignment tolerances are relative to the laser's outside diameter.
[2] Systems that do not include the control box do not comply with the Federal Regulations (21 CFR Subchapter J) as administered by the Center for Devices and Radiological Health. Purchaser acknowledges that his/her products must comply with these regulations before they can be sold to a customer.
[3] Modulation through side panel I/O port. Via TTL signal with 400 KOhm input impedance (VH>4V, VL < 3V); TTL needs to be applied for minimum of 10 msec for Radius 635 and 100 msec for 375/405/440.
[4] Electro-Static Discharge Standard IEC 1000-4-2, 1995.
[5] Non-condensing.
[6] Shipped with USA power cord, IEC320 input connection.

Radius

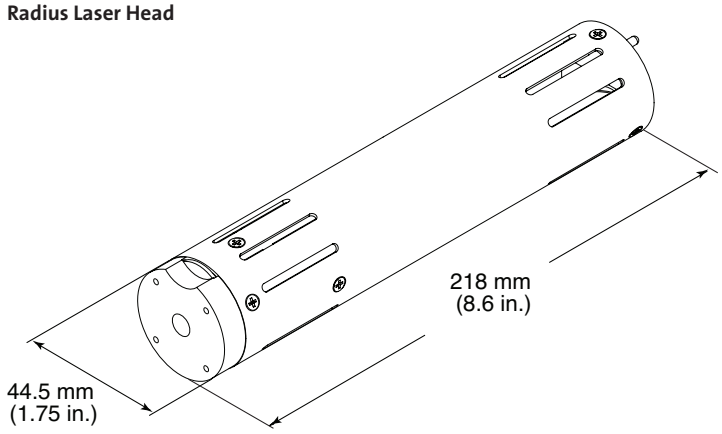
Diode Laser Systems

HeNe Comparison

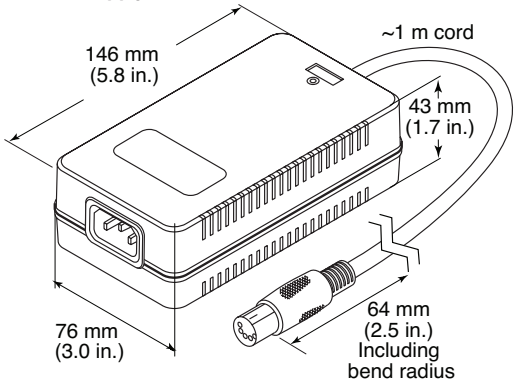
Radius 635 specifications are equal to or better than most HeNe lasers in most applications. Radius lasers also cost less and come in a smaller package. Both power stability and pointing stability are superior with the Radius. Warm-up time and output power over the laser's life are also far superior when compared to the HeNe. For all the details, please see the Radius 635 Competitive Comparison, found on the Radius page of our website, www.Coherent.com.

Radius Accessories	1039966	Control Box, CDRH, Keyswitch, Interlock	Control Box for Radius lasers. Included box, key, interlock RCA and cable.
	1080090	Cable, Extension, DB-9 M/F, 6 ft. (1.8 m)	Extension cable to extend control box. Male-Female, DB-9.
	1040408	Plug, RCA	Interlock RCA plug for Control Box, non-shorted
	1059300	Power Supply, LDM, 110/220VAC	Radius or ULN, Desktop, 43 Watt, Triple Output

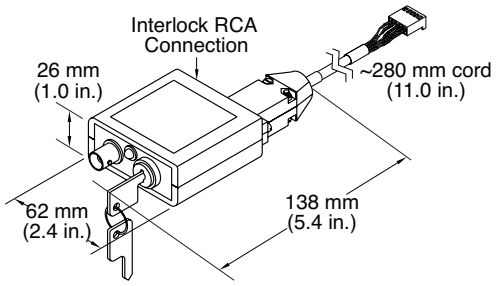
Radius Laser Head



Radius Power Supply



Radius Control Box



ULN

Diode Laser Modules

ULN-Series diode laser modules are designed for applications that require particularly low noise or mode-hop, noise-free operation. Sophisticated drive electronics are used to ensure low noise output. Typical RMS noise is 0.06% or better for detector bandwidth from 10 Hz to 10 MHz, with practically no warm-up time.

MicroBlaze™ beam circulation technology produces a high-brightness, diffraction-limited circular beam that is fully collimated with low divergence.

Overall, these low-noise, compact LabLasers are ideal replacements for HeNe lasers, which require higher power and generate more heat.

Applications include genomics, particle counting, flow cytometry, optical storage, confocal microscopy, high throughput drug screening, and spectroscopy. They are also ideal for biomedical instrument design.

The ULN-Series features an alternative solution to the mode-hop problem. Rather than regulate temperature, a special modulation is used to force the laser into a multi-longitudinal mode.

While a normal laser will operate in a single-mode longitudinal or oscillate between two strong modes, the modulation creates several modes of lower intensity. As the laser temperature increases, these modes move like a caterpillar across the wavelength spectrum. The movement does not allow abrupt changes, so the system operates as if there were no mode-hops.

The result is low RMS noise (~0.06%), which is stable over changes in temperature and the life of the diode laser module.

- ULN stabilizes both power and noise during temperature changes (note that wavelength varies with the standard temperature coefficient of the diode, ~0.2 nm/°C).
- ULN controls noise over the lifetime of the laser and will not develop mode-hop noise as the laser ages.
- ULN does not change the spatial qualities of the laser beam, so the beam can be focused to the same spot size, profile and shape.

The ULN laser is sold with a triple output power supply to provide the necessary +5V and +12V to drive the laser.

Use the LabLaser mount [part no. 0221-449-00] for convenient heat sinking and mounting with adjustable alignment.

ULN

Diode Laser Modules

Key Features

- Ultra-low noise (ULN)
- RMS noise <0.06% for bandwidths of 10 Hz to 10 MHz
- Circular beam
- No mode-hop noise
- No warm-up period
- Wavelength 635 nm with 5 mW CW power
- Long lifetime

ULN circular diode laser modules create a 1 mm circular output beam using MicroBlaze patented technology. This is a technique that accurately positions a fiber microlens inside the diode laser cap. The microlens uniquely corrects the divergence of the fast axis. Once corrected, the beam shape changes from elliptical to circular, providing maximum power transmission and less astigmatism than other methods. The circular low-divergence beams have almost no astigmatism and a total wave-front error typically less than λ/10. The M2 beam quality factor is typically 1.2 or better. These diode laser modules produce a beam of such high quality that they can replace more expensive HeNe lasers in many applications.

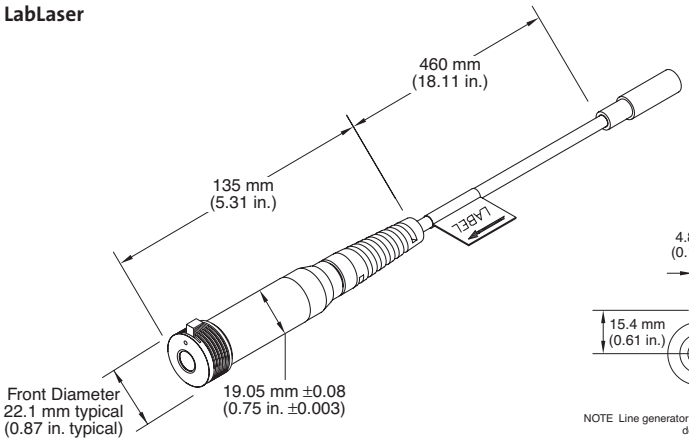
Compact, Rugged and Reliable

Our miniature laser modules are superb choices for many applications demanding affordable, compact lasers. Using AlignLock technology, all modules are optimized for thermal conductivity, protected from mechanical shock and deliver superior pointing accuracy and stability. These compact, rugged and reliable diode laser sources also have a sophisticated internal driver/controller circuit, which provides both surge and reverse polarity protection. The nominal operating temperature range is -10 to +40°C. Diode lifetime will be greater at lower temperatures.

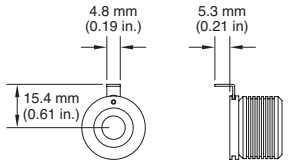
System Specifications

LabLaser™	635 nm 5 mW C ULN
Wavelength (nm)	635 +7/-2
Power (mW)	5
CDRH Class	Class IIIb, Non-Conforming
Spot Size (mm)	1
Divergence (mrad)	1
Laser Drive	ULN, Ultra-Low Noise
Power Supply	Included
Connector	5-pin DIN
Part Number	31-0144-000

LabLaser



Safety Shutter



NOTE Line generator modules (0220 936 00 and 31 0268 000) do not included shutter

Cross-Hair Line Generators

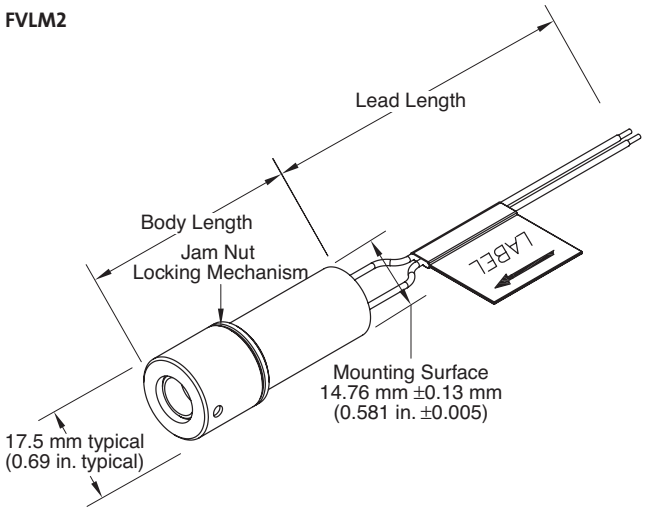
Key Features

- Focusable VLM2-style package
- High visibility 635 nm
- Adjustable line width and focus
- Dual-element optic design
- High-quality diffractive optic

Cross-Hair Line Generators deliver two sharp, high-brightness, fan-angle lines at 635 nm. These adjustable focus cross-hair generators are ideal for long-life projection and industrial applications. The adjustable focus allows the width of the line to be focused, while the length of the line remains fixed. The line can typically be focused as small as <0.1 mm at a distance of 10 cm or can be focused to as small as ~0.4 mm at a distance of 1.0 meter.

The front knob allows for easy adjustment of the line width and focus location. During adjustment the optics do not rotate and focusing action is even and uniform while beam alignment is maintained[3]. A locking ring is used to secure the focus in any position. Use the VLM2 mount [part no. 0221-437-00] for convenient heat sinking and mounting with adjustable alignment. For lasers without a connector, order plug no.1057734.

FVLM2



System Specifications

FVLM2	Cross-Hair 635 nm 0.6 mW	Cross-Hair 635 nm 1.7 mW
Wavelength (nm)	635 +7/-2	635 +7/-2
Power (mW)	0.55	1.7
CDRH Class	Class II	Class II
Spot Size (mm)	1 Adjustable	1 Adjustable
Divergence (mrad)	24° x 1 mrad Adjustable	24° x 1 mrad Adjustable
Laser Drive[1]	CW	CW
Power Supply[2]	5 to 10VDC	5 to 10VDC
Body Length (mm)	48 to 55	48 to 55
Lead Length (mm)	610	610
Connector	None	None
Part Number	0222-210-00	0222-209-00

[1] Laser Drive is Continuous Wave (CW) with constant power.
[2] Power Supply: For modules with 5-10VDC it is recommended that the module be operated at 5V.
[3] Note the focus adjustment may slightly affect the beam-pointing direction. Due to the numerical aperture of the lens, slight variations in beam output power may occur as the lens is adjusted.

Focusable Line Generator Modules

Focusable diode laser modules combine the technology of high-quality diode lasers with superior optics, sophisticated electronics and rugged alignment packaging. These modules can also be used in many applications to reduce the requirements for external optics. The result is an overall system that is smaller, simpler and less costly.

The adjustable focus is a great benefit for many applications. For machine vision, particle measurements and inspection—and their inherent need for direct measurements—the beam can be focused at a distance for the smallest spot size to optimize the system resolution.

The front knob allows for easy adjustment. During adjustment the optics do not rotate and focusing action is even and uniform while beam alignment is maintained[1]. A locking ring is used to secure the focus in any position. Use the VLM2 mount [part no. 0221-437-00] for convenient heat sinking and mounting with adjustable alignment. For lasers without a connector, order plug no. 1057734.

Compact, Rugged and Reliable

Our miniature laser modules are superb choices for many applications demanding affordable, compact lasers. Using AlignLock technology, all modules are optimized for thermal conductivity, protected from mechanical shock and deliver superior pointing accuracy and stability. These compact, rugged and reliable diode laser sources also have a sophisticated internal driver/controller circuit, which provides both surge and reverse polarity protection. The nominal operating temperature range is -10 to +40°C. Diode lifetime will be greater at lower temperatures.

Focusable line generators deliver sharp lines with adjustable line width, while the length of the line remains fixed. The line can be typically focused as small as <0.1 mm at a distance of 10 cm or can be focused to as small as ~0.4 mm at a distance of 1 meter.

[1] The focus adjustment may slightly affect the beam-pointing direction. Due to the numerical aperture of the lens, slight variations in beam output power may occur as the lens is adjusted.

Focusable Line Generator Modules

Key Features

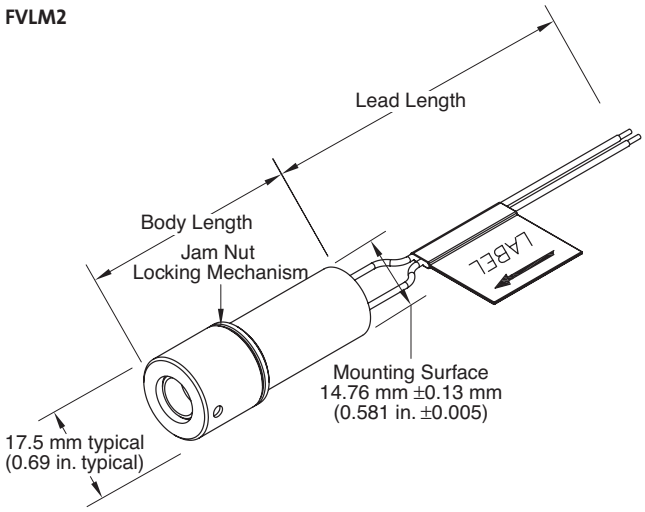
- Focusable VLM2 style package
- High visibility 635 nm
- Adjustable divergence and focus

Advantages of the Focus Feature

The focus feature can be used to:

- Adjust the beam propagation so that it diverges to create a larger spot at the target for broader illumination.
- Adjust the beam so that it converges to create a specific focus spot size at a certain working distance.
- Adjust the beam so that the beam waist is at a particular point in space.
- Adjust the beam to move the focus spot location when an external objective lens is used. This is especially useful when matching multiple wavelengths into the same beam focus position.
- Adjust the beam at the laser to reduce the need for expensive and bulky adjustable beam expanders.

FVLM2



System Specifications

FVLM2	635 nm 1.8 mW 60°
Wavelength (nm)	635 +7/-2
Power (mW)	1.8
CDRH Class	Class II
Spot Size (mm)	1 Adjustable
Divergence (mrad)	60° x 1 mrad Adjustable
Laser Drive	CW
Power Supply[1]	5 to 10VDC
Body Length (mm)	48 to 54
Lead Length (mm)	610
Connector	none
Part Number	0220-846-00

[1] Power Supply: For modules with 5-10VDC it is recommended that the module be operated at 5V.

Line Generator Diode Laser Modules

Line generators from Coherent project a clean, sharp line ~1 mm wide, with the line length represented by the specific fan angle. With fan angles of 40 or 60 degrees, a wavelength of 635 nm and various output powers available, line generators from Coherent offer the options you need for your particular application.

Use the appropriate VLM2 mount [part no. 0221-437-00]; or VLM3 mount [part no. 0221-448-00] for convenient heat sinking and mounting with adjustable alignment.

For lasers without a connector, order plug no. 1057734.

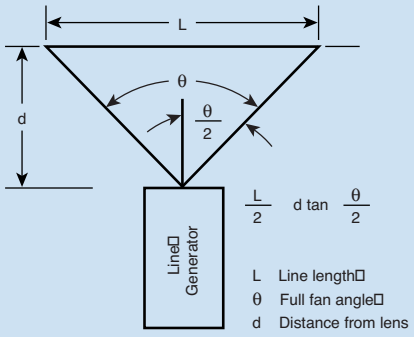
Compact, Rugged and Reliable

Our miniature laser modules are superb choices for many applications demanding affordable, compact lasers. Using AlignLock technology, all modules are optimized for thermal conductivity, protected from mechanical shock and deliver superior pointing accuracy and stability. These compact, rugged and reliable diode laser sources also have a sophisticated internal driver/controller circuit, which provides both surge and reverse polarity protection. The nominal operating temperature range is -10 to +40°C. Diode lifetime will be greater at lower temperatures.

Line Generator Line Length

The Coherent Line Generator projects a sharp line that is ~1 mm wide at the module face and ~1.5 mm wide at one meter. The length of a line is traditionally defined by specifying the visual fan angle, which is 85° for these modules. The 1/e2 intensity fan angle is about 65°.

Fan Angle θ	Line Length L			
	d = 0.25 m	d = 0.5 m	d = 1 m	d = 2 m
60°	0.29 m	0.58 m	1.16 m	2.31 m
40°	0.18 m	0.36 m	0.73 m	1.46 m

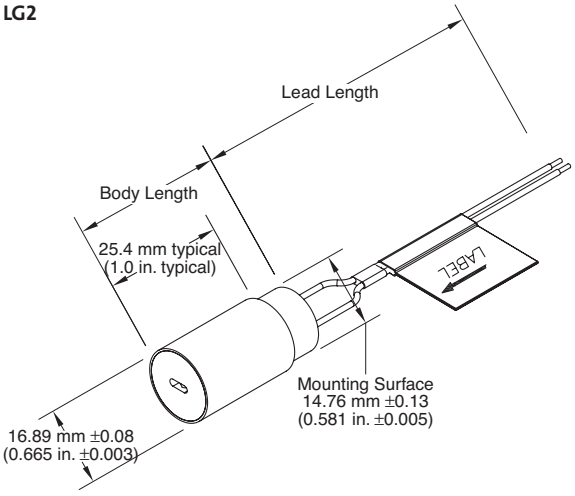


Line Generator Diode Laser Modules

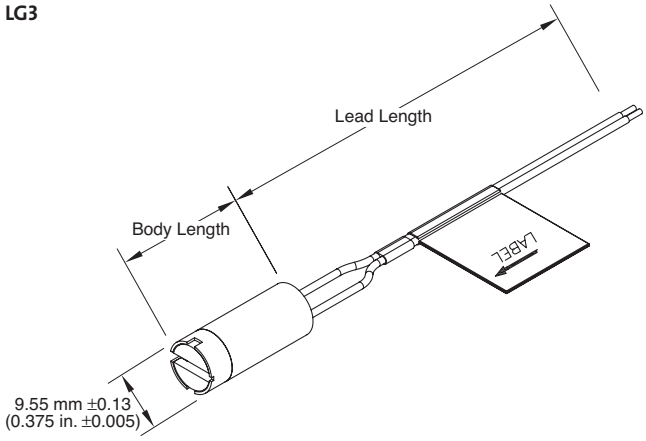
Key Features

- VLM2 and VLM3-style packages
- Optional adjustable line width and focus
- 40° or 60° fan angles
- High brightness 635 nm

LG2



LG3

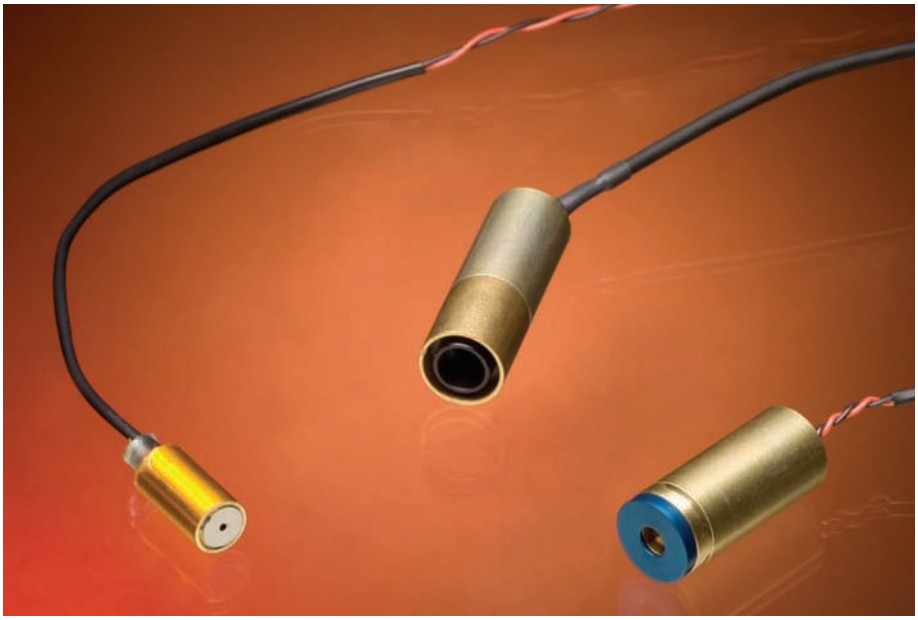


System Specifications

FVLM2	LG3 635 nm 1.5 mW 40°	LG2 635 nm 2 mW 60°
Wavelength (nm)	635 +7/-2	635 +7/-2
Power (mW)	1.5	2
CDRH Class	Class II	Class II
Spot Size (mm)	1	1
Divergence (mrad)	40° x 1	60° x 1
Laser Drive[1]	CW	CW
Power Supply[2]	3 to 6VDC	5 to 10VDC
Body Length (mm)	24	35
Lead Length (mm)	914	914
Connector	none	none
Part Number	0222-037-00	0220-934-00

[1] Laser Drive is Continuous Wave (CW) with constant power. For MVP option the laser includes a 3rd wire for Modulation and Variable Power Control
[2] Power Supply: For modules with 5-10VDC it is recommended that the module be operated at 5V. For modules with 3-6VDC it is recommended that the module be operated at 3.3V or 5V.

Miniature Diode Laser Modules



Circular and elliptical miniature diode laser modules provide the smallest package size and best value. Included inside every module are complete electronics to manage the constant power laser drive with a closed-light loop based on an internal photodiode. Also included in the electronics are protection circuits to provide a robust system in even the smallest of packages.

Miniature diode laser modules use the patented AlignLock technology to guarantee beam-pointing alignment of <4.3 mrad. This allows for simpler and easier integration, as you can trust the unit-to-unit consistency of each beam.

Use the appropriate VLM2 mount [part no. 0221-437-00] or the VLM3 mount [part no. 0221-448-00] for convenient heat sinking and mounting with adjustable alignment.

For lasers without a connector, order plug no. 1057734.

Miniature VLM2 circular diode laser modules create a 1 mm circular output beam using MicroBlaze patented technology. This is a technique that accurately positions a fiber micro-lens inside the diode laser cap. The micro-lens uniquely corrects the divergence of the fast axis. Once corrected, the beam shape changes from elliptical to circular, providing maximum power transmission and less astigmatism than other methods.

Miniature elliptical diode laser modules offer exceptional beam quality with a typical M2 of 1.4 or better in a typical 1 x 3 aspect ratio.

Compact, Rugged and Reliable
Our miniature laser modules are superb choices for many applications demanding affordable, compact lasers. Using AlignLock technology, all modules are optimized for thermal conductivity, protected from mechanical shock and deliver superior pointing accuracy and stability. These compact, rugged and reliable diode laser sources also have a sophisticated internal driver/controller circuit, which provides both surge and reverse polarity protection. The nominal operating temperature range is -10 to +40°C. Diode lifetime will be greater at lower temperatures.

Miniature Diode Laser Modules

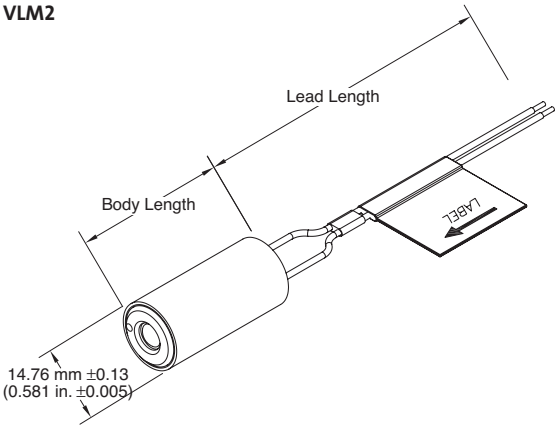
Key Features

- VLM2 and VLM3-style packages
- High visibility 635 nm, 650 nm, and 670 nm
- Circular or elliptical beams

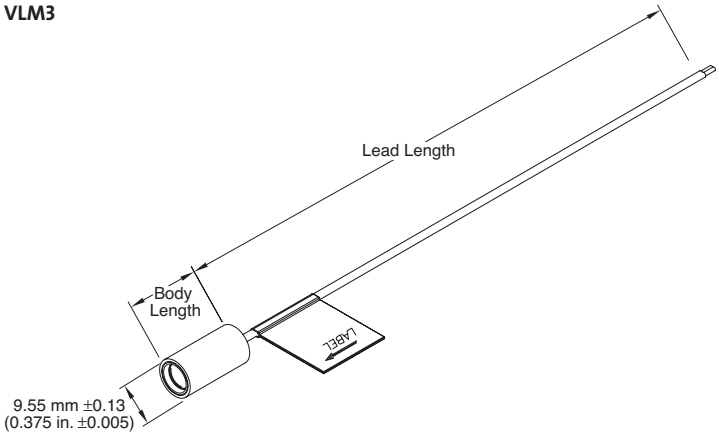
Circular 1 mm Beam

Circular diode laser modules produce a ~1 mm near-diffraction-limited beam. The circular lowdivergence beams have almost no astigmatism and a total wave-front error typically less than λ/10. The M2 beam quality factor is typically 1.2 or better. These diode laser modules produce a beam of such high quality that they can replace more expensive HeNe lasers in many applications. Circular diode laser modules are also smaller, require less power and generate less heat than traditional HeNe laser sources.

VLM2



VLM3



System Specifications

FVLM2	VLM2 635 nm 4 mW E	VLM3 670 nm 4 mW E	VLM2 670 nm 7.5 mW E	VLM2 635 nm 4 mW C 1 mm	VLM3 650 nm 1.6 mW C 1.3 mm
Wavelength (nm)	635 +7/-2	670 ±5	670 ±5	635 +7/-2	650 ±5
Power (mW)	4.2	4.2	7.5	4.2	1.6
CDRH Class	Class IIIa	Class IIIa	Class IIIb Non-Conforming	Class IIIa	Class IIIa Non-Conforming
Spot Size (mm)	5.8 x 1.7	4.6 x 1.3	3.4 x 1.3	1.3	1.3
Divergence (mrad)	0.2 x 0.6	0.2 x 0.7	0.3 x 0.8	0.7	0.8
Laser Drive[1]	CW	CW	CW	CW	CW
Power Supply[2]	5 to 10VDC	3 to 6VDC	5 to 10VDC	5 to 10VDC	5 to 6VDC
Body Length (mm)	32	19	28	34	26
Lead Length (mm)	914	914	305	914	914
Connector	none	none	none	none	none
Part Number	0221-534-00	0220-968-00	0223-038-00	0222-200-00	0222-002-01

[1] Laser Drive is Continuous Wave (CW) with constant power.
2 Power Supply: For modules with 5-10VDC it is recommended that the module be operated at 5V. For modules with 3-6VDC it is recommended that the module be operated at 3.3V or 5V.

Lasiris

Application Primers

What is Structured Light?

Structured light is the projection of a light pattern (plane, grid, or more complex shape) at a known angle onto an object. This technique can be very useful for imaging and acquiring dimensional information. The most often used light pattern is generated by fanning out a light beam into a sheet-of-light. When a sheet-of-light intersects with an object, a bright line of light can be seen on the surface of the object. By viewing this line of light from an angle, the observed distortions in the line can be translated into height variations.

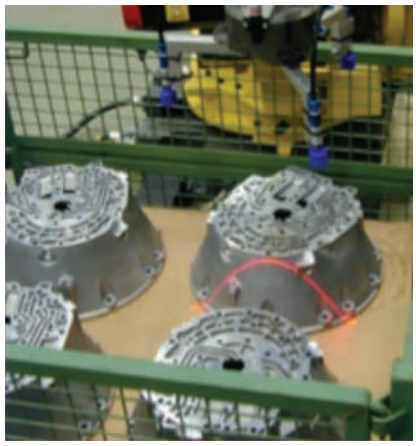
Acquiring 2-dimensional information

Scanning the object with the light constructs 3-D information about the shape of the object. This is the basic principle behind depth perception for machines, or 3D machine vision. In this case, structured lighting is sometimes described as active triangulation.

Since structured lighting can be used to determine the shape of an object in machine vision applications, it can also help recognize and locate an object in an environment. These features make structured lighting useful in assembly lines implementing process control or quality control. These methods use structured lighting for alignment and inspection purposes. Structured light systems can drastically transform a manufacturing plant by decreasing process variation, reducing production time, allowing automation of assembly lines, increasing precision, and generally decreasing overall cost. Although other types of light can be used for structured lighting, laser light is the best choice when precision and reliability are important.

Structured Light Applications

Coherent's Lasiris uniform intensity laser projectors are especially useful for structured light applications, including Machine Vision, Inspection, and Alignment.



Machine vision is a combination of structured lighting, a detector, and a computer to precisely gather and analyze data. For example, it is used on robots as 3-D guiding systems to place or insert a part on a car, such as a windshield wiper or a door.

Structured light lasers used in inspection minimize process variation by drawing attention to parts that do not conform to specifications. They can pick out vegetables with blemishes from food processor lines or can ensure that the right colored capsule goes in the correct bottle in drug packaging lines.

Another laser application is alignment. In computer assembly, a laser system can help an operator determine if a computer chip is perfectly positioned on a circuit board.

Lasiris lasers can be useful for contour mapping of parts, surface defect detection, depth measurements, guidelines, edge detection, and alignment. Coherent has standard laser configurations available off-the-shelf for a wide variety of applications, but lasers can also be custom manufactured for OEM clients, designed for specific applications.

Companies that are interested in integrating laser technology for machine vision and industrial inspection into the manufacturing process should involve our engineers at the design stage.

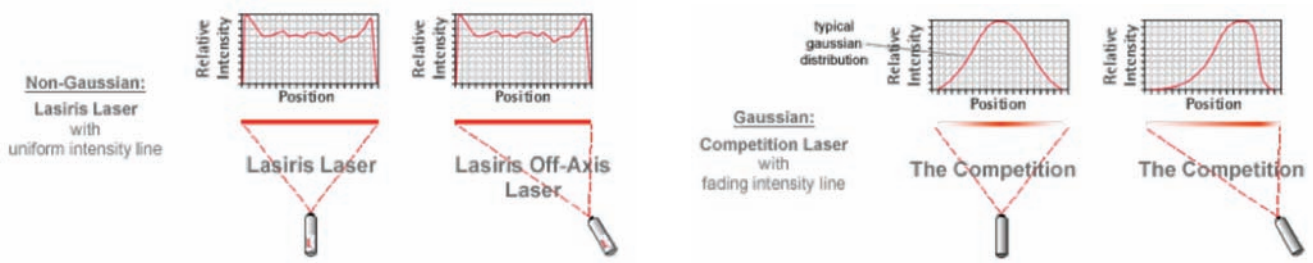
Lasiris

Application Primers

The Non-Gaussian Distribution

Most laser line generators on the market today use cylindrical optics to generate a line. We use a special Lasiris lens system that makes the lines non-gaussian (uniform) in intensity, even when the laser is off-axis.

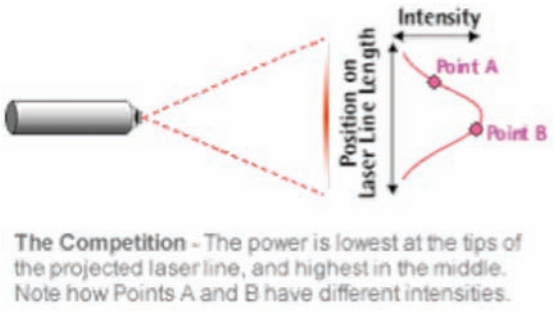
The Gaussian or Non-Gaussian distribution refers to the distribution of power over the projected laser line. The phrase Gaussian distribution (also called Normal Distribution) is a statistical term that refers to a bell-shaped graph.



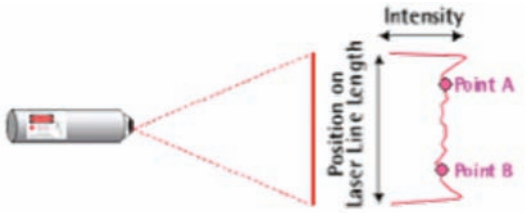
Why Uniform Intensity Lines are Important

Non-Gaussian Lines are Efficient

The light intensity of a Gaussian line fades away towards the ends of the line, eventually falling below the threshold level of the detector and becoming invisible to the system. Depending on the settings of the detector and the level of uniformity required by the application, as much as 50% of the available power can be lost.



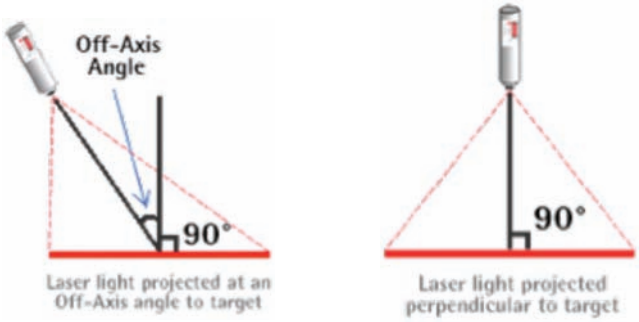
The Competition - The power is lowest at the tips of the projected laser line, and highest in the middle. Note how Points A and B have different intensities.



Lasiris™ Laser - A Lasiris line of light has a more uniform distribution of intensity. See how Points A and B have similar intensities.

Non-Gaussian Lines are Easy to Calibrate

Because the light intensity of gaussian lines is non-uniform, the calibration of CCDs can become very difficult. Separate calibrations must be made for pixels in the bright central area and for those in the transition area. The low intensity area cannot contribute to the calibration because it is invisible to the system.



An Off-Axis laser is a laser that is not perpendicular to the surface on which it is projecting laser light.

Lasiris

Application Primers

Lasiris Lasers can easily be adapted to an Off-Axis angle while maintaining uniform line intensity simply slide the line generating optic head slightly off center, see figure below, turn the laser ON and move optical head up and down until the projected line is uniform, then tighten the set-screw.

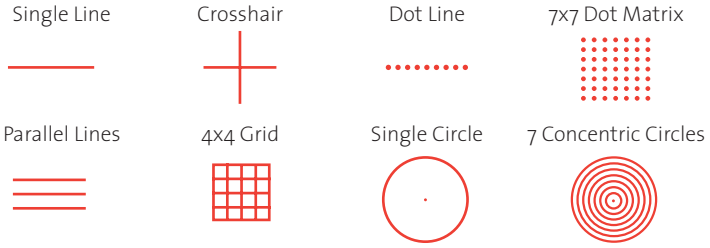
Diffractive Optics

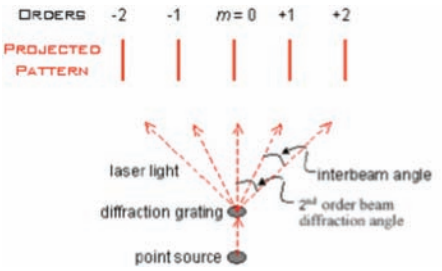
The following equation is used to calculate the diffraction angle of the pattern (lines or dots).

$d \sin(\theta_m) = m\lambda$ or $\theta_m = \sin^{-1}\left(\frac{m\lambda}{d}\right)$
where d = DOE period (µm)
θ = diffraction angle of the m^{th} beam (°)
λ = wavelength (µm)

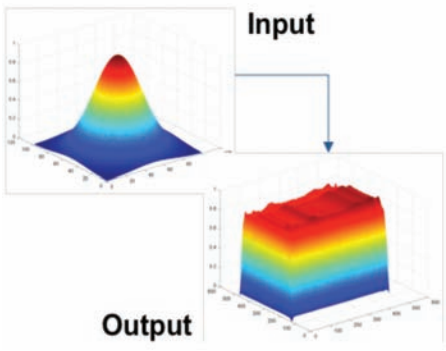
θ_m is the diffraction angle measured from the center to the mth beam. The interbeam angle is the angle between two neighboring beams (or orders) starting from the central beam (order 0) with the positive orders on one side (+1, +2, +3...) and the negative orders on the other side (-1, -2, -3...). The spreading angle, θs, between the two outmost beams (or lines, when a line generating lens is added) is twice the angle of the higher order beam.

For example, for a 5-line pattern at 670 nm with a period d = 25 µm, the spreading angle σs is twice the diffraction angle of the second order beam.





$$\theta_5 = 2\theta_m = 2\theta_2 \sin^{-1}\left(\frac{2.670\ \mu m}{25\ \mu m}\right) = \theta_5 = 6.14°$$



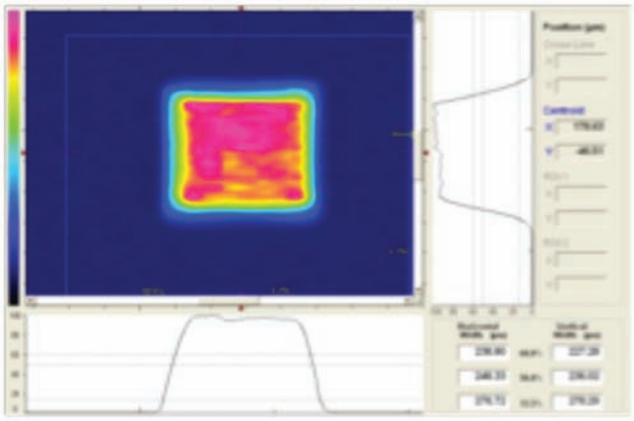
Beam Shaping Optics (Flat Top)

Optical system that convert a Gaussian laser beam intensity profile into a "box" profile which is based on two divergent aspheric cylinders that purposely aberrates the beam to create a uniform far field irradiance pattern. Intensity from the center of the Gaussian is redistributed to its edges extremely efficiently. 1 or both axis can be shaped. This "Flat Top" is a more efficient use of optical power. Sharp edges are often required as this results in no residual light outside the region of interest.

Lasiris

Application Primers

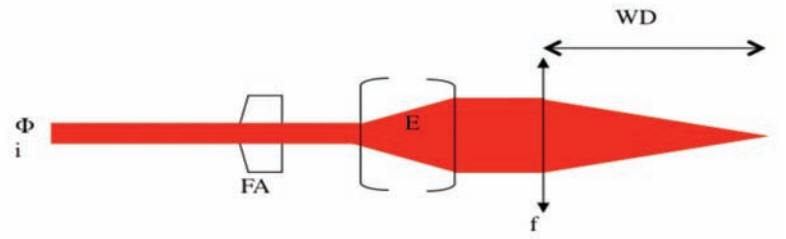
Spatial uniformity directly correlates to system performance for Light Induce Fluorescence and scatter type applications. This improves signal to noise especially for submicron LIF type applications.



Easier system alignment and more tolerant to system drift

The Flat top can be offered as either stand alone diverging flat top where the end user expands or focus the beam or as a complete focused system.

FA = Fan angle and is the divergence of the Powell, angles range from 0.25 up to 120 degrees
E = Beam expander expansion power
f = Focal length
WD = Working distance
Φ_i = input beam diameter @ $1/e^2$



Dimension of the flat top is directly proportional to the fan angle of the Powell and the effective focal length of the focusing system, irrespective of distance between the Powell and the focussing system.

$$\text{FTS (flat top size)} = \frac{2\tan\left(\frac{FA}{2}\right)f}{E}$$

Flat top uniformity is defined by Coefficient of variation, CV, which is the standard deviation divided by the mean. We typically offer CV's of under 1 percent

$$CV = \frac{StdDev}{Mean}$$

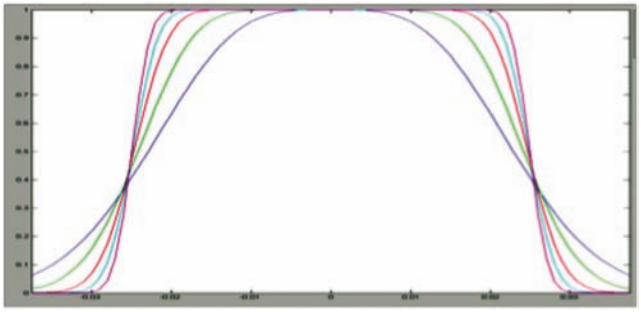
The Depth of Uniformity is proportional to the size of the flat top and the effective focal length of the system and indirectly proportional to the input beam diameter

$$DOU = \frac{FTS * f}{2\Phi_i}$$

Φ_i = distance where variation change is ~25%

The steepness ration is defined by the flat top size divided by the diffraction limited spot size without the shaper.

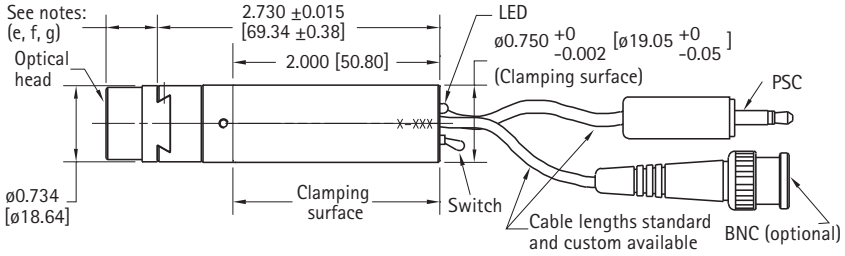
$$R\ (\text{steepness ratio}) = \frac{\sin\left(\frac{FA}{2}\right)H\Phi}{2\lambda}$$



Lasiris SNF

Structured Light Pattern Generating Laser

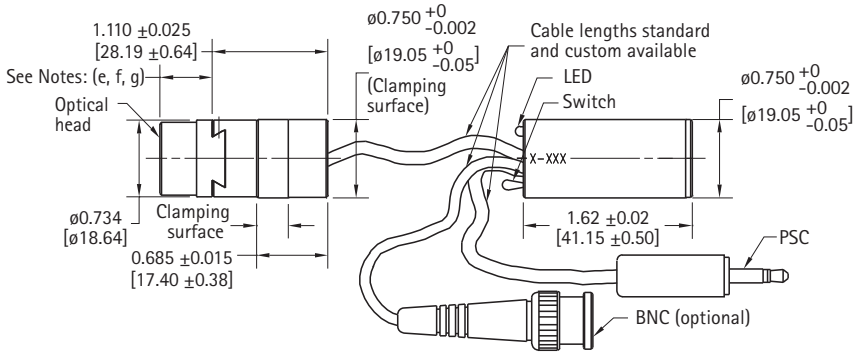
Standard SNF Laser



Notes: (e) Add 0.500 [12.70] for the 501L series of pattern generators
(f) Add 0.750 [19.05] for the 701L series of pattern generators
(g) Add 1.200 [30.48] for the 701L series with a type 2 collimating lens

Top View

SNF Laser with Separate Electronics Option



Top View

Lasiris SNF

Structured Light Pattern Generating Laser

Key Features

- 635 nm to 1550 nm
- Power up to 200 mW
- Uniformity down to ±15% for laser line generators
- Wide range of patterns and fan angles
- Focusable
- ESD, over-temperature, over-voltage, and reverse-polarity protection
- Rugged, shock and vibration resistant design
- 1D and 2D flat top compatible

Ordering Information

SNF lasers are covered under a 2-year warranty (parts and labor). To order, use the following code: **MODEL-(Fast/Slow axis)(Pattern)-(Interbeam Angle)-(Wavelength)(Electronic Option)-Power-Fan Angle-Custom Options**. E.g., **SNF-501L-635S-10-10**. Additional options can be specified at time of order. Contact us for more details.

	501L or 701L	**503L or 703L**	**505L or 705L**	**509L or 709L**	**511L or 711L**
Pattern	1 line	3 lines	5 lines	9 lines	11 lines
Interbeam Angle[1]	-	1.5°, 5.0°, 11.7°	0.23°, 1.55°	0.11°, 0.07°	1.5°

	515L or 715L	**519L or 719L**	**533L or 733L**	**565L or 765l**	**599L or 799L**
Pattern	15 lines	19 lines	33 lines	65 lines	99 lines
Interbeam Angle[1]	2.3°	0.77°	0.09°, 0.38°	0.41°	0.149°

	501S	**504G**	**501H**	**501C**	**507C**
Pattern	1 sqaure	4x4 grid	crosshair	1 circle	7 concentric circles
Interbeam Angle[1]	2.9°	2.44°	-	0.77°, 11.4°	0.77°

	507X	**519X**	**Custom**
Pattern	7x7 dot matrix	19x19 dot matrix	
Interbeam Angle[1]	1.9°	0.77°	

Wavelength (nm)	635	660	690	785	810	830
Diode Power (mW)	1,5, 10, 15, 35	1,5, 10, 20, 35, 50	20, 35	20, 35, 75, 90	100, 200	30, 100, 150
Fan Angle	1°[2], 5°, 10°, 15°, 20°, 30°, 45°, 60°, 75°, custom					

[1] The interbeam angle is specified at 670 nm. The angle is proportional to wavelength
[2] Not standard for crosshair projectors.

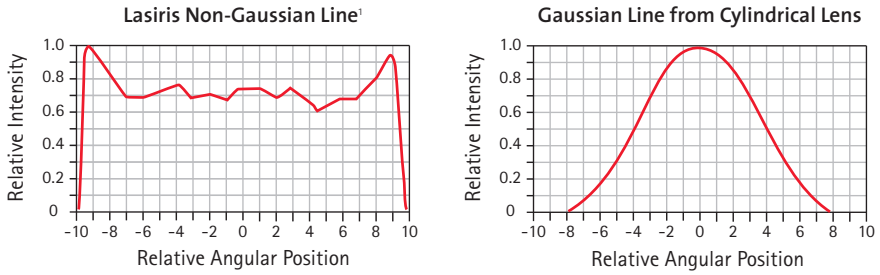
Lasiris SNF

Structured Light Pattern Generating Laser

Uniform Intensity

Conventional laser line patterns are often generated by cylindrical optics that produce a Gaussian line profile with a bright center and fading ends. Lasiris patented beam shaping optics spread the light into an evenly illuminated line. The result is a crisp, uniform line with sharp ends.

Line Intensity Profile Along Line Length

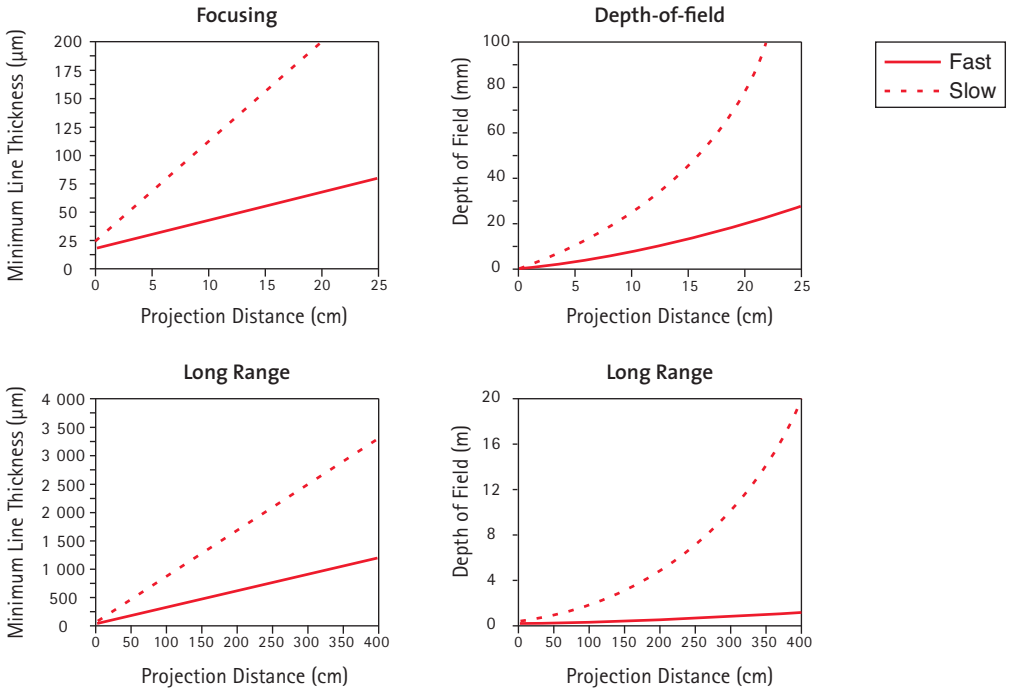


Relative Intensity vs. Angular Position Along Line Length

Focusing Performance

The following figures show the typical focusing and depth-of-field performance of the SNF laser line generator. The focus charts indicate the minimum line thickness (at 1/e²) achievable for a specific projection distance. The depth-of-field is defined as twice the distance over which the thickness of the line has increased by a factor of √2.

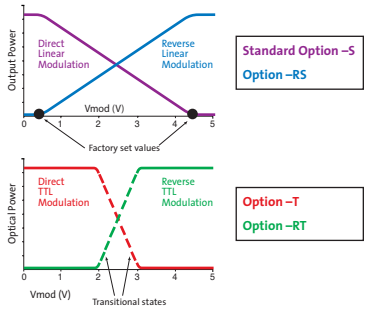
Focusing and Depth-of-Field Performance



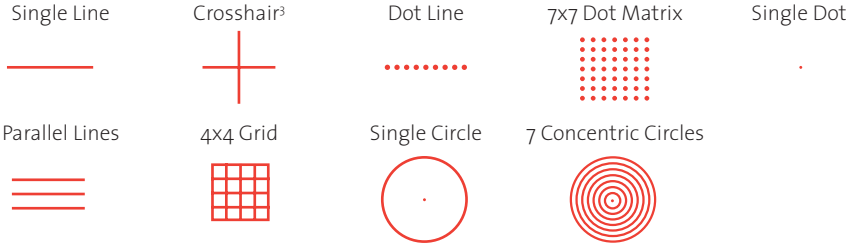
[1] Typical profile.

Lasiris SNF

Structured Light Pattern Generating Laser

Optical Specifications	Wavelength (nm)	635 to 1550
	Output Power (mW)	1 to 200
	Intensity Distribution[1]	Uniform (non-Gaussian) lengthwise, Gaussian widthwise
	Fan Angles[2] (°)	1 to 120 and custom
	Line Uniformity[2]	30% uniformity over 80% of the pattern[1]
	Bore Sighting[4] (mrad)	<3
Mechanical Specifications	Weight (g)	65 (with separate electronic: 70)
	Housing Material	Black anodized aluminum
Environmental Specifications	Operating Temperature (°C)	-10 to +48 with bracket
	Wavelength Drift (nm/°C)	0.25 typical
	Storage Temperature (°C)	-20 to 60
	Over-Temperature Protection (°C)	up to 48
Electrical Specifications	Power Supply Voltage (VDC)	4.8 to 6.5 (6 optimal) Optional 9, 12, 24 , 115/220 VAC
	Connector Type	Male phono-jack 3.5 mm Ø or custom
	Slow Start Time Delay (msec)	<250 for most models
	Reverse-Polarity Protection, Over-Voltage Protection	
	Beam Modulation	Via optional BNC connector
	ESD Protection (kV)	Discharge: Contact = 4; Indirect =4; Air =8
Options	Power Options	
	Power Adjustment Potentiometer	Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".
	Power Adjustment by External Signal	 Standard modulation S (synchro) or RS (reverse synchro): DC to 10 kHz S: Input voltage = 0VDC → laser "ON" RS: Input voltage = 5VDC → laser "ON" T (TTL) or RT (Reverse TTL): DC to 10 kHz Transition 2 to 3 VDC T: Input voltage = 0VDC → laser "ON" RT: Input voltage = 5V → laser "ON" "Fast" Modulation FS (fast synchro), FRS (fast reverse synchro) or FT (fast TTL0, FRT (fast reverse TTL) DC to 300 kHz
	Input Impedance (kΩ)	>1
	Rise/Fall Time (µs)	<10 for S and RS, <0.8 for FS and RFS
	Separate Electronic Option	The electronics of the laser can be separated from the main unit. See diagram "SNF laser with separate electronics option" on first page. Code "SD".

Available Patterns



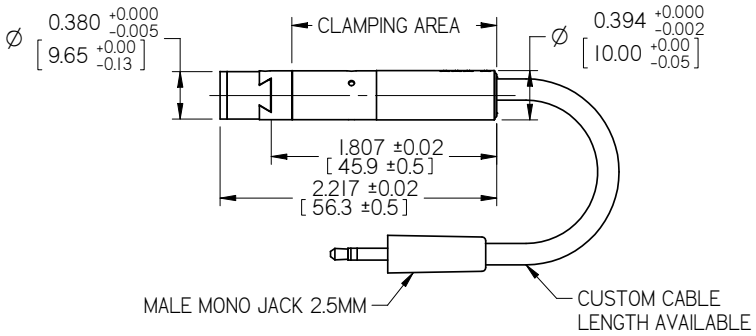
[1] Improve line uniformity to ±25, 20, or 15%. Request this option at the time of order.
[2] For line generators.
[3] Lasiris crosshair projectors have a single optical component, unlike conventional crosshairs that are formed either by using two lasers or by splitting and recombining one beam to form a cross.
[4] Define boresight method.

Lasiris Mini

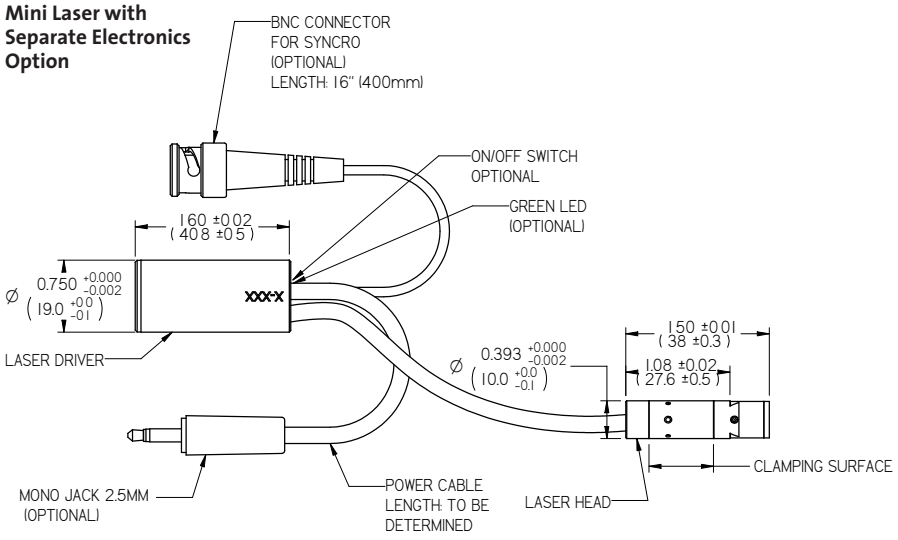
Compact Structured Light Pattern Generating Laser

Mechanical Specifications

Standard Mini Laser



Mini Laser with Separate Electronics Option



Lasiris Mini

Compact Structured Light Pattern Generating Laser

Key Features

- Compact and lightweight
- 635 nm to 830 nm
- Wide range of powers, patterns, and fan angles
- Uniform intensity distribution with line generators
- Focusable
- ESD, over-temperature, and reverse-polarity protection
- 1D and 2D flat top compatible

Ordering Information

Mini lasers are covered under a 2-year warranty (parts and labor). To order, use the following code: **MODEL-(Fast/Slow axis)(Pattern)-(Interbeam Angle)-(Wavelength)(Electronic Option)-Power-Fan Angle-Custom Options**. E.g., **MINI-501L-635S-10-10**. Additional options can be specified at time of order. Contact us for more details.

	501L or 701L	503L or 703L	505L or 705L	509L or 709L	511L or 711L
Pattern[1]	1 line	3 lines	5 lines	9 lines	11 lines
Interbeam Angle[2]	-	1.5°, 5.0°, 11.7°	0.23°, 1.55°	0.11°, 0.07°	1.5°

	515L or 715L	519L or 719L	533L or 733L	599L or 799L	501S
Pattern[1]	15 lines	19 lines	33 lines	99 lines	1 square
Interbeam Angle[2]	2.3°	0.77°	0.09°, 0.38°	0.149°	2.9°

	504G	501H	507X	519X	Custom
Pattern[1]	4x4 grid	crosshair	7x7 dot matrix	19x19 dot matrix	
Interbeam Angle[2]	2.44°	-	1.9°	0.77°	

Wavelength (nm)	635	660	690	785	830	Custom
Diode Power (mW)	1,5, 10	1,5, 10, 20, 35	20, 35	20, 35	30	
Fan Angle	1°[3], 5°, 10°, 15°, 20°, 30°, 45°, 60°, 75°, 120°, custom					

[1] Line patterns are also available as dots -- add "D" nstead of "L" in the order code.
[2] At 660 nm.
[3] Not standard for crosshair projector.

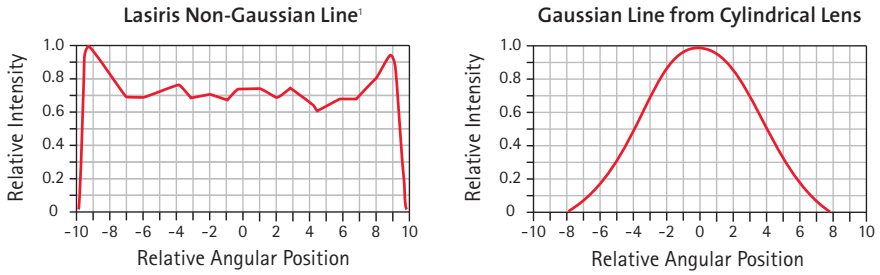
Lasiris Mini

Compact Structured Light Pattern Generating Laser

Uniform Intensity

Conventional laser line patterns are often generated by cylindrical optics that produce a Gaussian line profile with a bright center and fading ends. Lasiris patented beam shaping optics spread the light into an evenly illuminated line. The result is a crisp, uniform line with sharp ends.

Line Intensity Profile Along Line Length

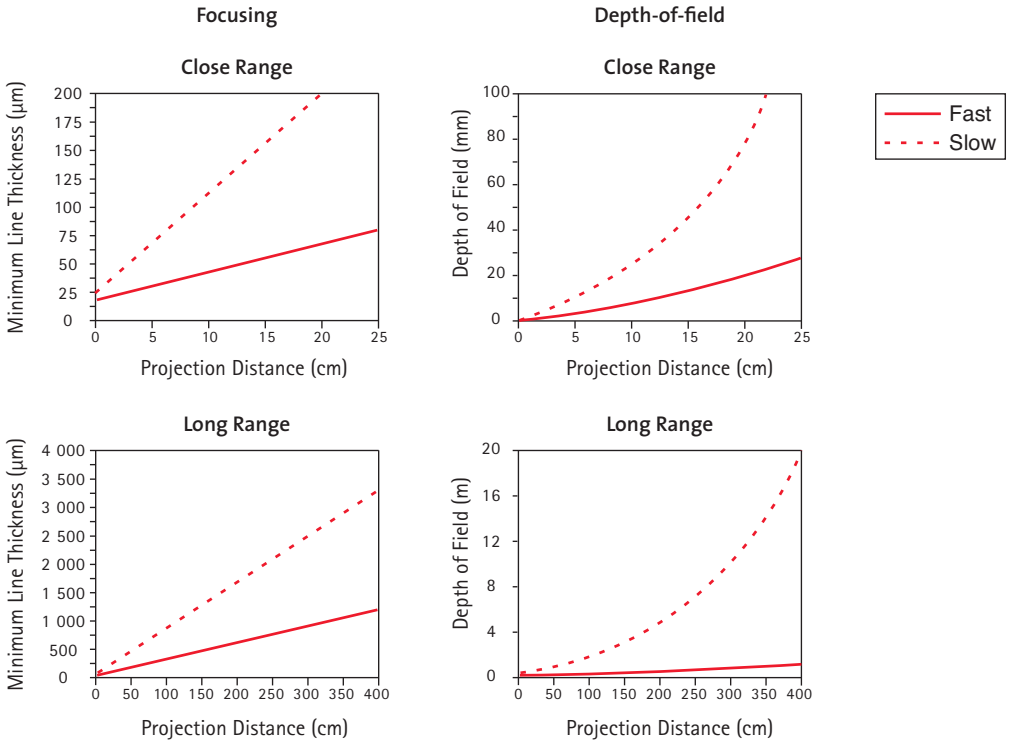


Relative Intensity vs. Angular Position Along Line Length

Focusing Performance

The following figures show the typical focusing and depth-of-field performance of the SNF laser line generator. The focus charts indicate the minimum line thickness (at 1/e²) achievable for a specific projection distance. The depth-of-field is defined as twice the distance over which the thickness of the line has increased by a factor of √2.

Focusing and Depth-of-Field Performance



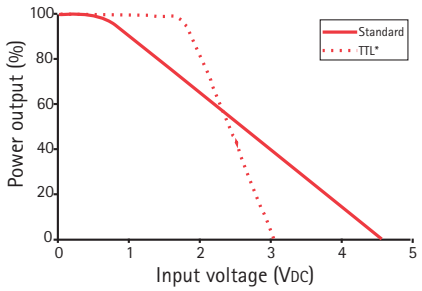
[1] Typical profile.

Lasiris Mini

Compact Structured Light Pattern Generating Laser

Optical Specifications	Wavelength (nm)	635 to 830
	Output Power (mW)	1 to 40
	Intensity Distribution	Uniform (non-Gaussian) lengthwise, Gaussian widthwise
	Fan Angles (°)	1 to 120
	Line Uniformity	±30% uniformity over 80% of the pattern
	Bore Sighting (mrad)	<3
Mechanical Specifications	Weight (g)	12
	Housing Material	Black anodized aluminum
Environmental Specifications	Operating Temperature (°C)	-10 to +48 with bracket
	Wavelength Drift (nm/°C)	0.25 typical
	Storage Temperature (°C)	-20 to 60
	Over-Temperature Protection (°C)	up to 48
Electrical Specifications	Power Supply Voltage (VDC)	5 ±5% 6 with optional separate driver Optional 115/220 VAC
	Connector Type	Male phono-jack 2.5 mm Ø or custom
	Slow Start Time Delay (msec)	250
	Reverse-Polarity Protection	
	ESD Protection (kV)	Discharge: Contact = 4; Indirect =4; Air =8
Options	Power Options	
	Power Adjustment Potentiometer	Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".
	Power Adjustment by External Signal	Standard Modulation (Available only on SD configuration) S (syncro) or RS (reverse syncro): DC to 10 kHz Linear for amplitude 1.0 to 4.0 Vdc S: Input Voltage = 0VDC → laser "ON" RS: Input Voltage = 5VDC → laser "ON" T (TTL): DC to 10 kHz Transition 2 to 3 VDC T: Input Voltage = 0VDC → laser "ON" "Fast" Modulation FS (fast syncro), FRS (fast reverse syncro) or FT (fast TTL) DC to 300 kHz
	Input Impedance (kΩ)	>1
	Rise/Fall Time (µs)	<10
	Separate Electronic Option	The electronics of the laser can be separated from the main unit. See diagram "Mini laser with separate electronics option" on first page. Code "SD".

Power Adjustment Curves



Available Patterns

Single Line

Crosshair[1]

Dot Line

7x7 Dot Matrix

Parallel Lines

Single Square

Single Dot

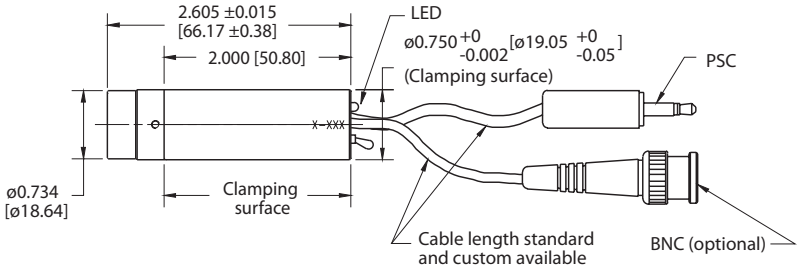
[1] Lasiris crosshair projectors have a single optical component, unlike conventional crosshairs that are formed either by using two lasers or by splitting and recombining one beam to form a cross.

Lasiris DLS and DLSC

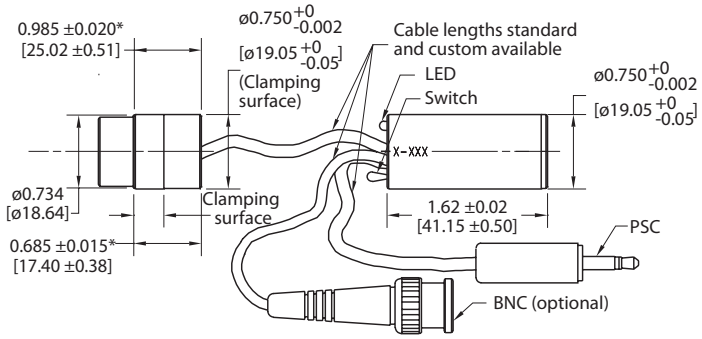
Elliptical and Circular Spot Projectors

Mechanical Specifications

Standard DLS/C Lasers



DLS/C Laser with Separate Electronics Option



*Add 0.325 in. (8.26 mm) for DLSC lasers.
Some combinations of specifications may result in different dimensions.

Lasiris DLS and DLSC

Elliptical and Circular Spot Projectors

Key Features

- Elliptical or circular beam
- Wide range of wavelengths and powers
- Focusable
- ESD, over-temperature, over-voltage, and reverse-polarity protection
- Rugged, shock and vibration resistant design

Ordering Information

Lasers are covered under warranty (parts & labor) for 2 years (DLS) and 1 year (DLSC). To order, use the following code: **MODEL-(Fast/Slow)-Wavelength(Electronic Option)-Power-Custom Options**. E.g., **DLS-635T-1-SD**. Contact us for more details.

Wavelength(nm)	635	660	690	785	830
DLS Diode Power (mW)	1, 5, 10, 15, 35	1, 5, 10, 20, 35, 50, 100	20, 35	20, 35, 75	30, 100, 150
DLSC Diode Power (mW)	1, 5, 10, 15, 35	1, 5, 20, 35, 50	20, 35	20, 35, 75	100, 150

Lasiris DLS and DLSC

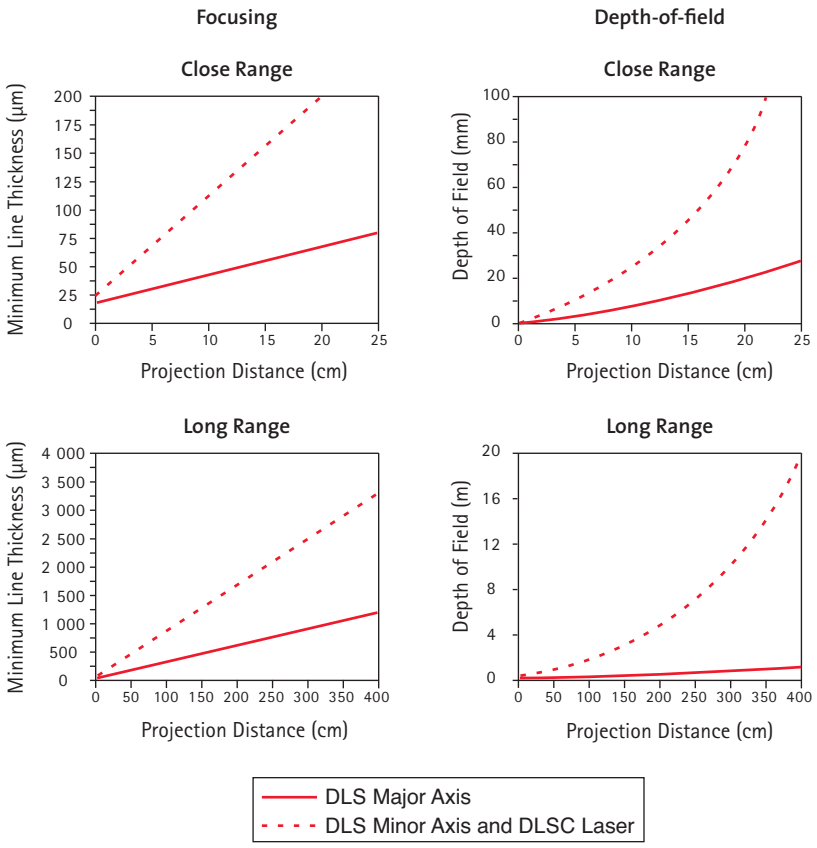
Elliptical and Circular Spot Projectors

Focusing Performance

The DLSC typically deviates from circularity by no more than 1.2 to 1 ratio of the major to the minor axis. For the DLS, the spot is elliptical (1:3 ratio of axes) because the laser diode has a rectangular aperture. The following figures show the typical focusing and depth-of-field (at $1/e^2$) performance of the DLS and DLSC spot projectors. The solid lines on the graphs apply to the major axis of the DLS and the dotted lines apply to the DLSC and to the minor axis of the DLS.

The focus charts indicate the minimum spot thickness (at $1/e^2$) achievable for a specific projection distance. The depth-of-field is defined as twice the distance over which the spot thickness has increased by a factor of $\sqrt{2}$.

Focusing and Depth-of-Field Performance



The smallest achievable beam width can be determined using these focus charts. However, the laser can also be adjusted to project a wider spot at a given projection distance, or collimated for minimum divergence. The focus is adjustable with our C-Thru Focus key, or the focus can be set at the factory. By specifying the desired spot diameter and working distance, the laser can be preset to your precise requirements. A collimating focal lens is available on request.

Lasiris DLS and DLSC

Elliptical and Circular Spot Projectors

Optical Specifications	Wavelength (nm)	635 to 1550 (varies with model)
	Output Power (mW)	1 to 150 (varies with model)
	Spot Diameter	See focus charts
	Bore Sighting (mrad)	<3
Mechanical Specifications	Weight (g)	DLS: 54, DLSC: 60
	Housing Material	Black anodized aluminum
Environmental Specifications	Operating Temperature (°C)	-10 to +48 with bracket
	Wavelength Drift (nm/°C)	0.25 typical
	Over-Temperature Protection (°C)	Built-in: 48
Electrical Specifications	Power Supply Voltage (VDC)	5 to 6 Optional 9, 12, 24 , 115/220 VAC
	Connector Type	Male phono-jack 3.5 mm Ø or custom
	Slow Start Time Delay (µsec)	250 (for most models)
	Reverse-Polarity Protection, Over-Voltage Protection	

Options

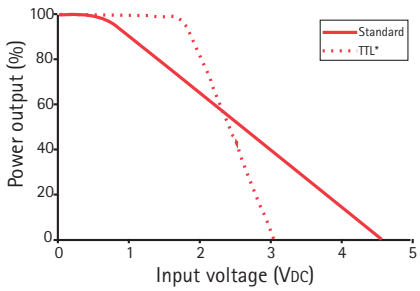
Power Options

Power Adjustment Potentiometer

Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".

Power Adjustment by External Signal

Power Adjustment Curves



Standard modulation
S (synchro) or RS (reverse synchro): DC to 10 kHz
S: Input voltage = 0VDC → laser "ON"
RS: Input voltage = 5VDC → laser "ON"

T (TTL) or RT (Reverse TTL): DC to 10 kHz
Transition 2 to 3 VDC
T: Input voltage = 0VDC → laser "ON"
RT: Input voltage = 5V → laser "ON"

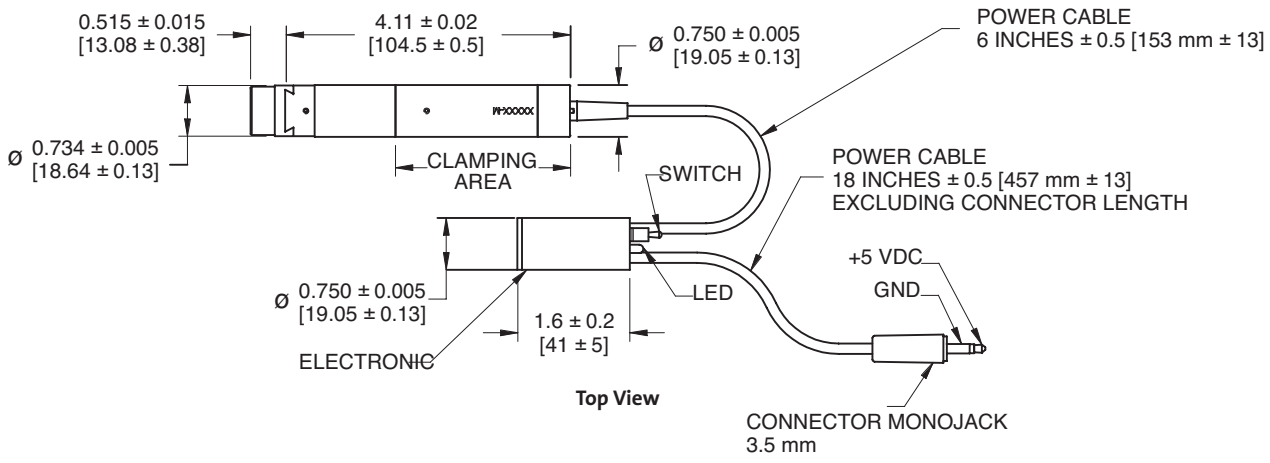
"Fast" Modulation
FS (fast synchro), FRS (fast reverse synchro) or
FT (fast TTL0, FRT (fast reverse TTL)
DC to 300 kHz

Input Impedance (kΩ)	>1
Rise/Fall Time (µs)	10 for 10 KHz , 0.8 for 300 kHz
Separate Electronic Option	Electronics of the laser can be separated from the main unit. See diagram "DLS/C laser with separate electronics option" in first page. Code "SD".

Lasiris GLL

Green Structured Light Pattern Generating Laser

Mechanical Specifications



Lasiris GLL

Green Structured Light Pattern Generating Laser

Key Features

- High visibility, high contrast laser
- Stable output power
- Line generators that have a uniform intensity distribution
- Many patterns available
- Focusable
- ESD, over-voltage, and reverse-polarity protection
- Uniformity down to ±15% for line generators

Ordering Information

Green lasers are covered under a warranty of 1 year (parts and labor). To order, use this code: **MODEL-(Fast/Slow axis) (Pattern)-(Interbeam Angle)-("532" for Wavelength)(Electronic Option)-Power-Fan Angle-Custom Options**. E.g., **GLL-503L(1.2°)-532-1-5-SD**.

	501L or 501D	503L or 503D	505L or 505D	509L or 509D	511L or 511D
Pattern	1 line or 1 dot	3 lines or 3 dots	5 lines or 5 dots	9 lines or 9 dots	11 lines or 11 dots
Interbeam Angle[1]	-	1.2°, 4.0°, 9.2°	0.18°, 1.23°	0.09°, 0.06°	1.2°
Diode Power (mW)	1, 5, 10				
Fan Angle	1°[2], 5°, 10°, 15°, 20°, 30°, 45°, 60°, 75°, custom				

	515L or 5151D	519L or 519D	533L or 533D	599L or 599D	501S
Pattern	15 line or 15 dots	19 lines or 19 dots	33 lines or 33 dots	99 lines or 99 dots	1 square
Interbeam Angle[1]	1.8°	0.61°	0.07°, 0.30°	0.118°	2.3°
Diode Power (mW)	1, 5, 10				
Fan Angle	1°[2], 5°, 10°, 15°, 20°, 30°, 45°, 60°, 75°, custom				

	504G	501H	501C	507C	507X
Pattern	4x4 grid	crosshair	1 circle	7 concentric cicles	7x7 dot matrix
Interbeam Angle[1]	1.93°	-	0.61°, 9.0°	0.61°	1.5°
Diode Power (mW)	1, 5, 10				
Fan Angle	1°[2], 5°, 10°, 15°, 20°, 30°, 45°, 60°, 75°, custom				

	501H	Custom
Pattern	19x19 dot matrix	
Interbeam Angle[1]	0.61°	
Diode Power (mW)	1, 5, 10	
Fan Angle	1°[2], 5°, 10°, 15°, 20°, 30°, 45°, 60°, 75°, custom	

[1] At 532 nm.
[2] Not standard for crosshair projectors.

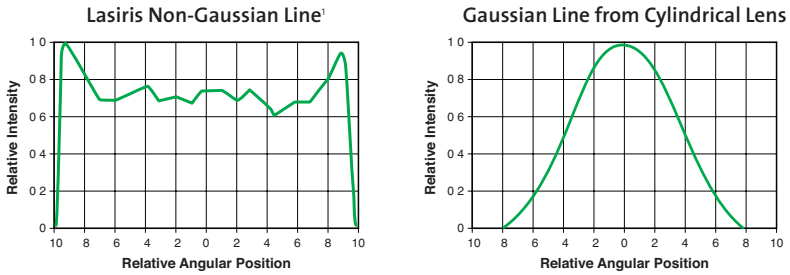
Lasiris GLL

Green Structured Light Pattern Generating Laser

Uniform Intensity

Laser line patterns are often generated by cylindrical optics that produce a Gaussian line profile with a bright center and fading ends. Lasiris patented optics spread the light into an evenly illuminated line. The result is a crisp, uniform line with sharp ends.

Line Intensity Profile Along Line Length

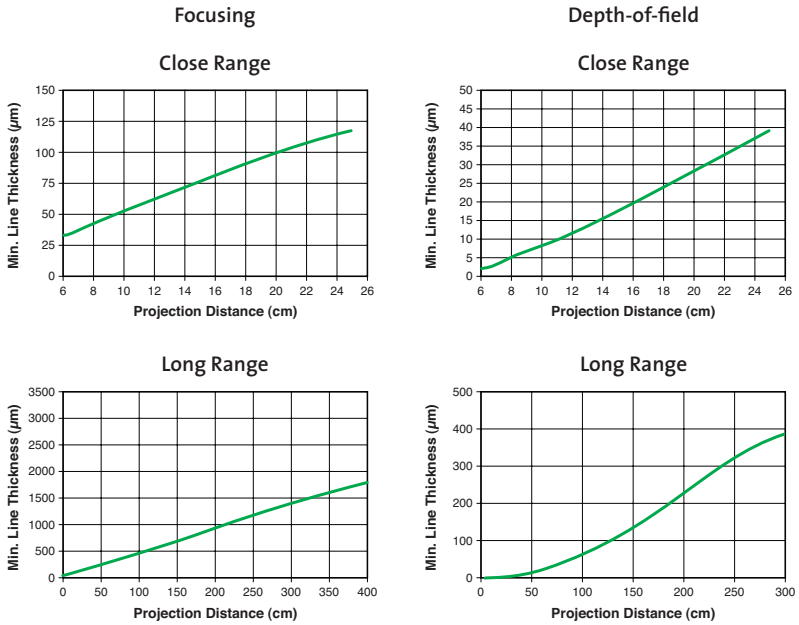


Relative Intensity vs. Angular Position Along Line Length

Focusing Performance

The following figures show the typical focusing and depth-of-field performance of the Green laser projector. The focus charts indicate the minimum line thickness (at $1/e^2$) achievable for a specific projection distance. The depth-of-field is defined as twice the distance over which the thickness of the line has increased by a factor of $\sqrt{2}$.

Focusing and Depth-of-Field Performance



[1] Typical profile.

Lasiris GLL

Green Structured Light Pattern Generating Laser

Optical Specifications	Wavelength (nm)	532 ±1
	Output Power (mW)	1, 5, 10
	Mode	TEM00 (Gaussian profile)
	Intensity Distribution[1]	Uniform (non-Gaussian) lengthwise, Gaussian widthwise
	Fan Angles (°)	1 to 120 and custom
	Line Uniformity	30% uniformity over 80% of the pattern[1]
	M^2	<1.5
	Power Stability Over Temperature Range (%)	10
	Power Stability at Constant Temperature (%)	5
	Factory Set Focus (m)	1
	Line Thickness (focus)	See focusing charts
	Bore Sighting (mrad)	<3 over focus range
Mechanical Specifications	Weight (g)	100
	Housing Material	Black anodized aluminum
Environmental Specifications	Operating Temperature (°C)	+15 to +35
	Storage Temperature (°C)	-40 to +50
	Wavelength Drift (nm/°C)	0.25 typical
	ESD Protection (kV)	Discharge: Contact = 4; Indirect= 4; Air= 8
Electrical Specifications	Power Supply Voltage (VDC)	5 ±1
	Connector Type	Male phono-jack 3.5 mm
	Operating Mode	Constant average power
	Over-Voltage Protection (V)	Up to 12
	Reverse-Polarity Protection	

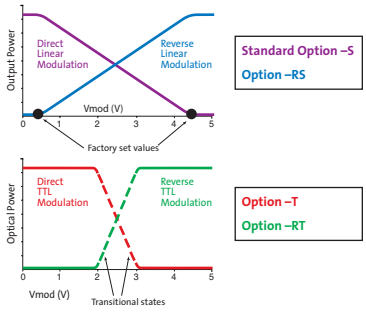
Options

Power Options

Power Adjustment Potentiometer

Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".

Power Adjustment by External Signal

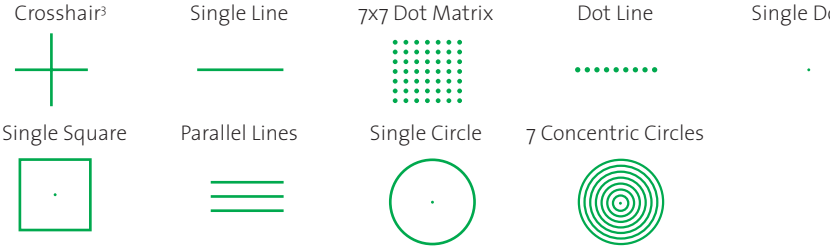


Standard modulation
S (synchro) or RS (reverse synchro): DC to 10 kHz
S: Input voltage = 0VDC → laser "ON"
RS: Input voltage = 5VDC → laser "ON"

T (TTL) or RT (Reverse TTL): DC to 10 kHz
Transition 2 to 3 VDC
T: Input voltage = 0VDC → laser "ON"
RT: Input voltage = 5V → laser "ON"

"Fast" Modulation
FS (fast synchro), FRS (fast reverse synchro) or
FT (fast TTLo, FRT (fast reverse TTL)
DC to 300 kHz

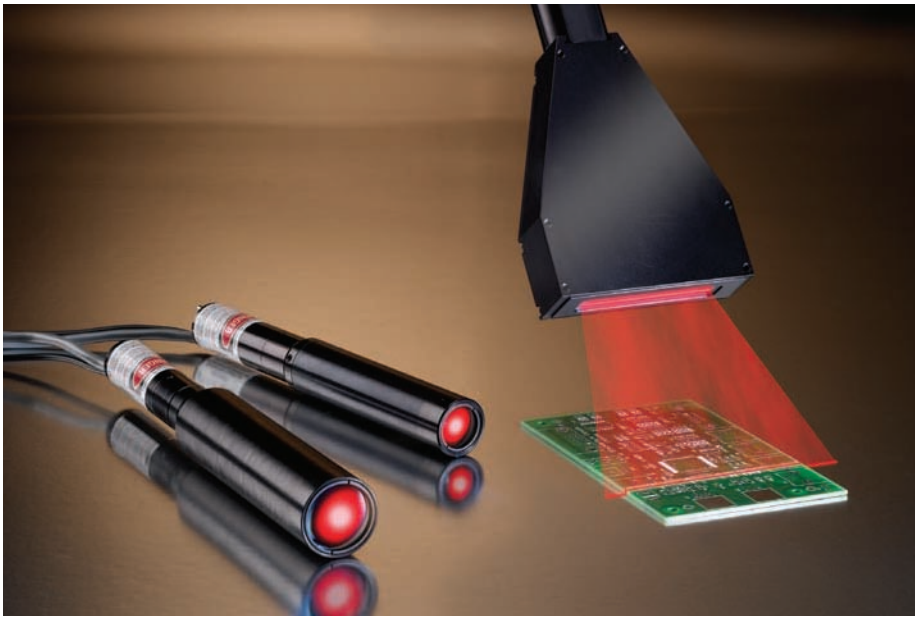
Available Patterns[2]



[1] Improve line uniformity to ±25, 20, or 15%. Request this option at the time of order.
[2] Other patterns available.
[3] Lasiris crosshair projectors have a single optical component, unlike conventional crosshairs that are formed either by using two lasers or by splitting and recombining one beam to form a cross.

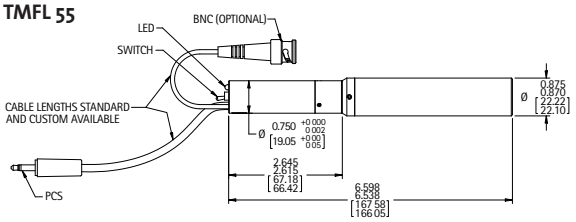
Lasiris TMFL

Micro-Focus Telecentric Laser Line Pattern Generating Laser



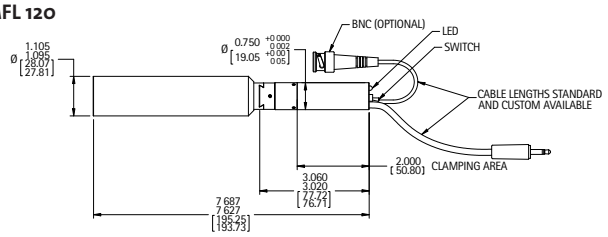
Mechanical Specifications

TMFL 55



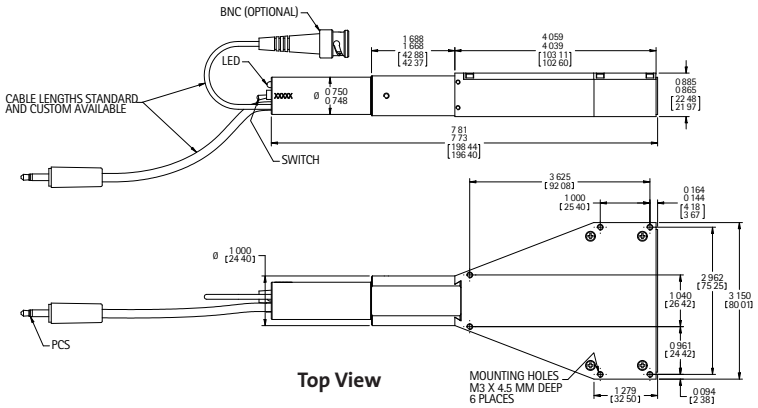
Top View

TMFL 120



Top View

TMFL 125 Side View



Top View

Lasiris TMFL

Micro-Focus Telecentric Laser Line Pattern Generating Laser

Key Features

- Constant line width along entire line length
- Extremely thin lines down to 9.0 µm at 1/e²
- Line length up to 60 mm
- Highly efficient optical system
- Uniform intensity distribution
- ESD, over-temperature, over-voltage, and reverse-polarity protection

Ordering Information

TMFL lasers 660 nm are covered under a 2-year warranty (parts & labor). To order, select from the specifications below. **Code: TMFL-Wavelength-Diode Power-Electronics Option-Working Distance-Line Length**. E.g., **TMFL-660-100-P-55-10, TMFL-660-100-FT-125-30**. Call us or visit our website for updates and other specifications.

Wavelength (nm)	660		
Diode Power (mW)	100[1]		
Electronics Option	N/A, P, T, S, FS, FT		
Working Distance (mm)	55	120	125
Line Length (mm)	5, 7, 10	10, 20, 30	30, 45, 60

[1] Also available in 670 nm - 500 mW, 810 nm - 1W. Power can be adjusted down to 20 mW by potentiometer as a standard option.

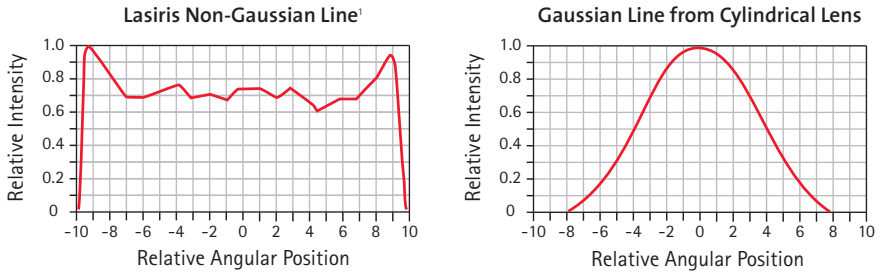
Lasiris TMFL

Micro-Focus Telecentric Laser Line Pattern Generating Laser

Uniform Intensity

Conventional laser line patterns are often generated by cylindrical optics that produce a Gaussian line profile with a bright center and fading ends. Lasiris patented beam shaping optics spread the light into an evenly illuminated line. The result is a crisp, uniform line with sharp ends.

Line Intensity Profile Along Line Length



Relative Intensity vs. Angular Position Along Line Length

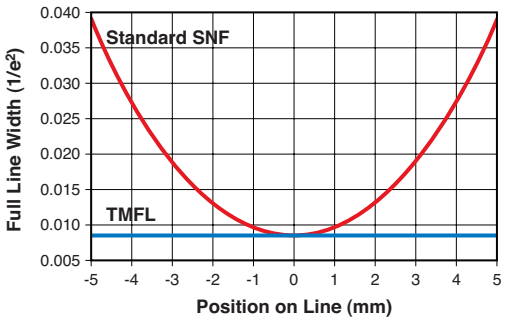
Line Thickness and Depth-of-Field

TMFL lasers feature factory-set focusing for specific working distances. The table below shows the typical thickness (at $1/e^2$) and depth-of-field performance of a 660 nm wavelength TMFL. The depth-of-field is defined as twice the distance over which the thickness of the line has increased by a factor of $\sqrt{2}$.

Main characteristic of the TMFL laser is its ability to maintain a constant line thickness along the entire line length when projected on a flat plane.

	TMFL 55	TMFL 120	TMFL 125
Depth-of-Field (mm)	0.2	1	1
Working Distance (mm)	55	120	125
Line Width (µm)	9	25	25
Line Length[2] (mm)	5 to 10	10 to 30	30 to 60
Line Uniformity (%)	≤25	≤25	≤25

Line Thickness vs. Position on Line



The "Thickness vs Position" graph shows how the line thickness of the SNF laser increases farther away from the center of the line. The TMFL is built with an optical system that creates a constant line thickness when the laser is projected on a flat plane.

[1] Typical profile.
[2] Line length can be customized.

Lasiris TMFL

Micro-Focus Telecentric Laser Line Pattern Generating Laser

Optical Specifications	Wavelength (nm)	660
	Output Power (mW)	100
	Intensity Distribution	Uniform (non-Gaussian) for line
	Bore Sighting (mrad)	<3
Mechanical Specifications	Housing Material	Black anodized aluminum
Environmental Specifications	Operating Temperature (°C)	-10 to +48
	Wavelength Drift (nm/°C)	0.25 typical
	Thermal Stability	Less than 5% change in focus over multiple temperature cycling from 10°C to 30°C
	Over-Temperature Protection (°C)	Built-in: 48
Electrical Specifications	Power Supply Voltage (VDC)	4.8 to 6.5 (6 optimal) Optional 9, 12, 24 , 115/220 VAC
	Connector Type	Male phono-jack 3.5 mm Ø or custom
	Slow Start Time Delay (msec)	<250 for most models
	Reverse-Polarity Protection, Over-Voltage Protection	
	Beam Modulation	Via optional BNC connector
	ESD Protection (kV)	Discharge: Contact = 4; Indirect =4; Air =8

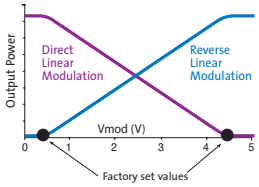
Options

Power Options

Power Adjustment Potentiometer

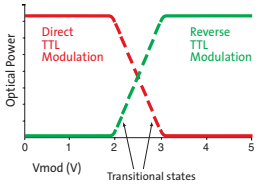
Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".

Power Adjustment by External Signal



Standard Option –S
Option –RS

Standard modulation
S (synchro) or RS (reverse synchro): DC to 10 kHz
S: Input voltage = 0VDC → laser "ON"
RS: Input voltage = 5VDC → laser "ON"



Option –T
Option –RT

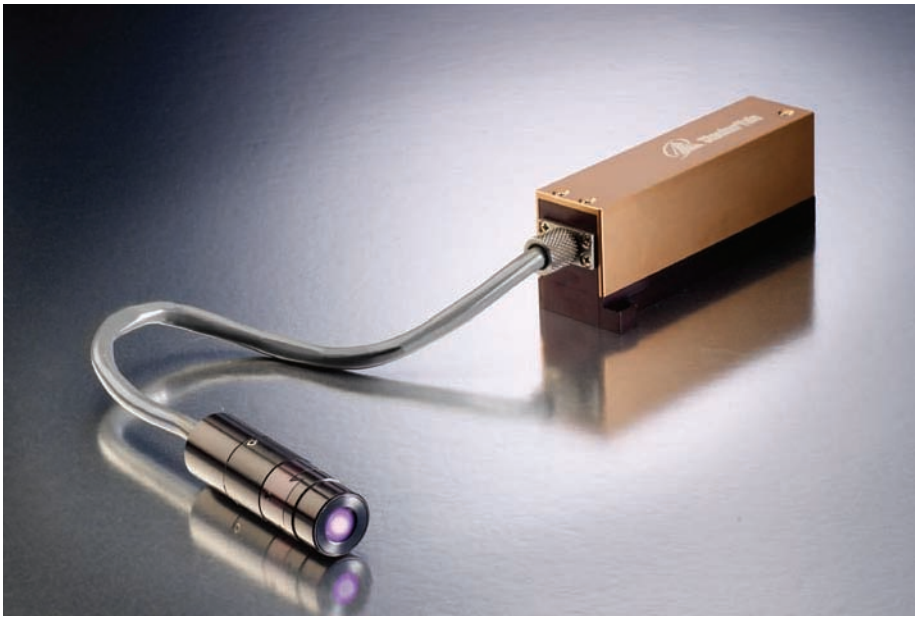
T (TTL) or RT (Reverse TTL): DC to 10 kHz
Transition 2 to 3 VDC
T: Input voltage = 0VDC → laser "ON"
RT: Input voltage = 5V → laser "ON"

"Fast" Modulation
FS (fast synchro), FRS (fast reverse synchro) or
FT (fast TTLo, FRT (fast reverse TTL)
DC to 300 kHz

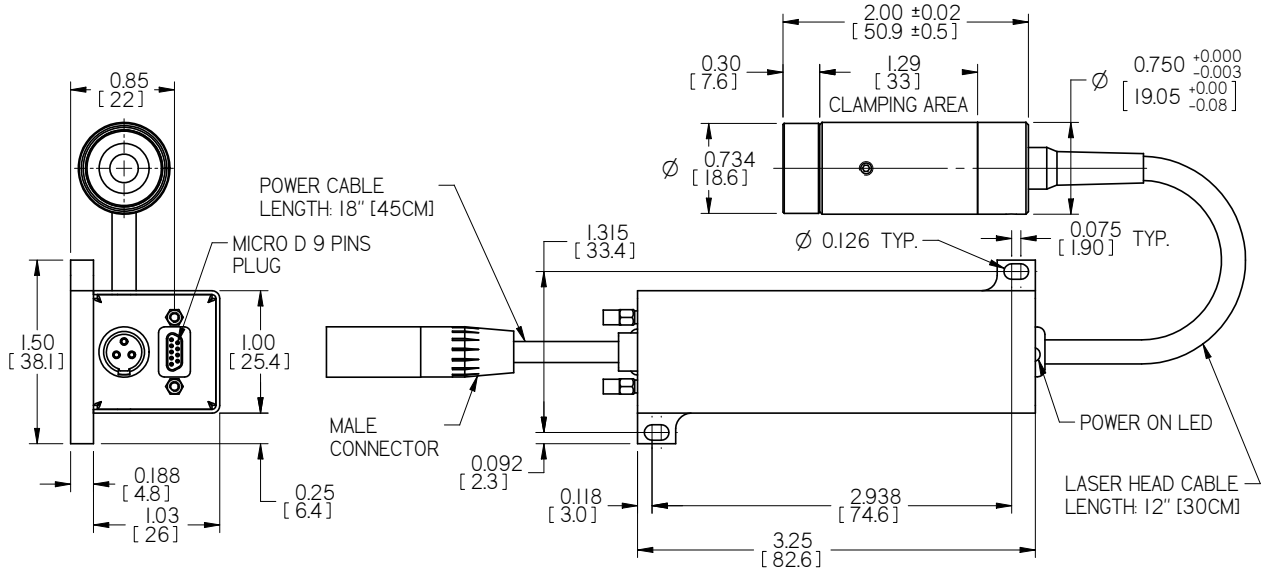
Input Impedance (kΩ)	>1
Rise/Fall Time (µs)	10 for 10 KHz, 0.8 for 300 KHz
Separate Electronic Option	The electronics of the laser can be separated from the main unit. Code "SD".

Lasiris ColdRay

Compact Thermoelectrically Cooled Laser



Mechanical Specifications



Rear View **Top View**

Lasiris ColdRay

Compact Thermoelectrically Cooled Laser

Key Features

- 375 nm, 405 nm, 445 nm, 473 nm, 640 nm, 660 nm
- Excellent wavelength and power stability
- Excellent pointing stability
- Compatible with standard 1D and 2D flat top projector
- Extended lifetime
- Analog and digital modulation
- Circular models available
- Focusable

Ordering Information

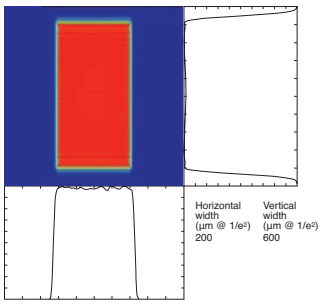
To order, use the following code: **MODEL-(Fast/Slow axis)(Pattern)-(Interbeam Angle)-(Wavelength)(Electronic Option)-Power-Fan Angle-Custom Options**. E.g., **CR-501L-405S-60-20**. Call us or visit our website for available optical patterns such as Flat-Top and diffractive optics.

Wavelength (nm)	375	405	445	473	640	660
Diode Power (mW)	20	5, 10, 20[1], 30, 40, 60[1], 80, 105[1], 120	50	20	5, 10, 35, 80	35, 50, 100, 150[1]
Electronics Option	S, T, RS, RT					

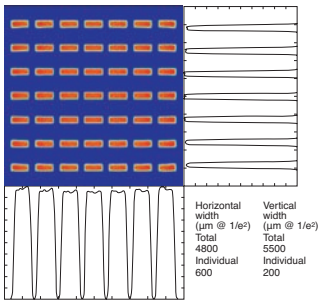
[1] No internal photodiode.

Compatible with Micro Flat Top Generators

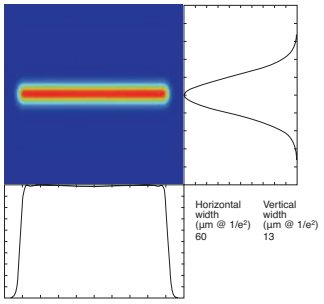
Flat Top 2D



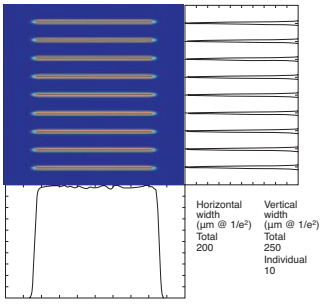
Flat Top Matrix 2D



Flat Top 1D



Flat Top Matrix 1D



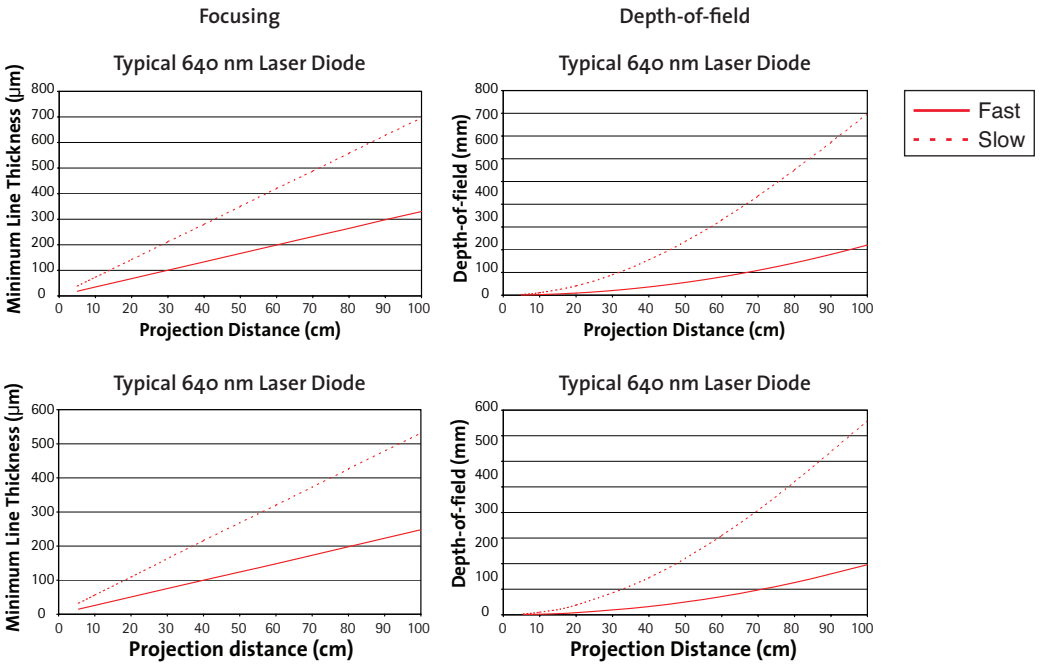
Lasiris ColdRay

Compact Thermoelectrically Cooled Laser

Focusing Performance

The following figures show the typical focusing and depth-of-field performance of the ColdRay laser beam. The focus charts indicate the minimum line thickness (at 1/e²) achievable for a specific projection distance. The depth-of-field is defined as twice the distance over which the thickness of the line has increased by a factor of √2.

Focusing and Depth-of-Field Performance



Wavelength-Dependent Parameters

Wavelength[1] (nm)	375	405	445	473	640	660
Wavelength Tolerance (nm)	+5/-5	+8/-5	+5/-5	+5/-5	+5/-5	+10/-10
Maximum Laser Diode Power (mW)	20	120	50	20	80	150
Output Power after Collimating Optics	15	90	35	15	60	75
Coll. Beam Dia. (1/e²) at Exit (mm)[2]	2.6 x 1.0	2.3 x 1.1	2.6 x 1.0	2.8 x 1.1	2.8 x 1.3	2.2 x 1.3
Collimated Beam Divergence (mrad)[3]	<0.6	<0.6	<0.7	<0.7	<0.8	<0.8
M² (ModeMaster x,y)	≤1.2	≤1.2	≤1.2	≤1.2	≤1.2	≤1.2
Transverse Mode	TEM00	TEM00	TEM00	TEM00	TEM00	TEM00
Polarization Extinction Ratio[4] (dB)	>17	>17	>17	>17	>17	>17
Polarization Axis	TE	TE	TE	TE	TE	TE
Warm-Up Time (sec.)	1	1	1	1	1	1

[1] Other wavelengths available. Please call for more details.
[2] Dependent on laser diode choice.
[3] Full anlge. Dependent on laser diode choice.
[4] Typical.

Lasiris ColdRay

Compact Thermoelectrically Cooled Laser

Optical Specifications	Power Stability in Operation 1 hr, 25°C (%)	≤±0.5
	Power Stability in Operation 24 hrs, 25°C (%)	≤±1
	Pointing Stability (µrad/°C)	<10
	Noise	
	RMS, 20 Hz to 20 MHz (%)	<0.5
	P-P, 20 Hz to 20 MHz (%)	<1
Environmental Specifications	Operating Temperature (°C)	0 to 40
	Storage Temperature (°C)	-20 to 60
	Operating Pressure and Humidity	Atmospheric/non-condensing
	Over-Temperature Protection, ESD Protection	
Electrical Specifications	Input Voltage/Current (V)	5 ±10% at 2A max (typical 1A)
	Modulation	
	Rise/fall time (µs)	5 (faster response time available upon demand)
	Reverse-Polarity Protection, Over-Voltage Protection	
	Input Impedance (kΩ)	>1
	Slow Start Time Delay (msec)	<250 (most models)

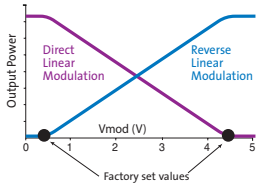
Options

Power Options

Power Adjustment Potentiometer

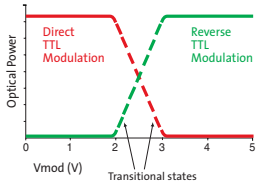
Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".

Power Adjustment by External Signal



Standard Option –S
Option –RS

Standard modulation
S (synchro) or RS (reverse synchro): DC to 10 kHz
S: Input voltage = 0VDC → laser "ON"
RS: Input voltage = 5VDC → laser "ON"

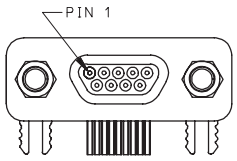


Option –T
Option –RT

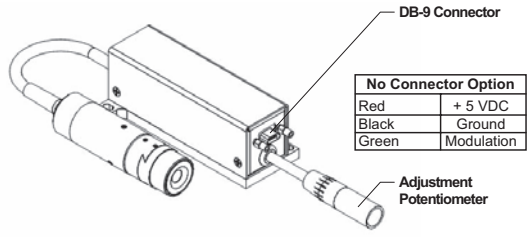
T (TTL) or RT (Reverse TTL): DC to 10 kHz
Transition 2 to 3 VDC
T: Input voltage = 0VDC → laser "ON"
RT: Input voltage = 5V → laser "ON"

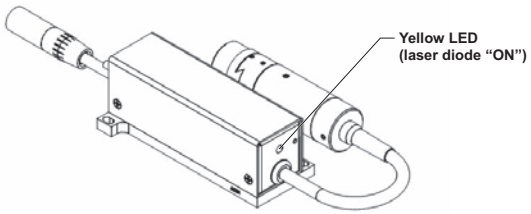
"Fast" Modulation
FS (fast synchro), FRS (fast reverse synchro) or
FT (fast TTLo, FRT (fast reverse TTL)
DC to 300 kHz

DB-9 Pinout and Back Panel Diagram



PIN 1 TEC Control Voltage (Black*)
PIN 2 Reserved for Calibration (Brown*)
PIN 3 Not Connected (Red*)
PIN 4 Current/Power Monitoring Output (Orange*)
PIN 5 Ground (Yellow*)
PIN 6 TEC Current Monitoring (Green*)
PIN 7 Modulation Input (Blue*)
PIN 8 Reserved for Calibration (Violet*)
PIN 9 Diode Temperature Monitoring (Gray*)
*Wire color on optional Micro DB 9 cable



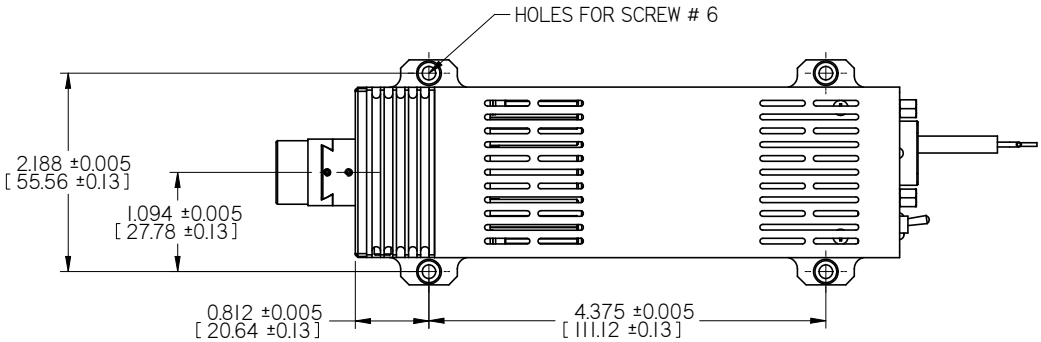


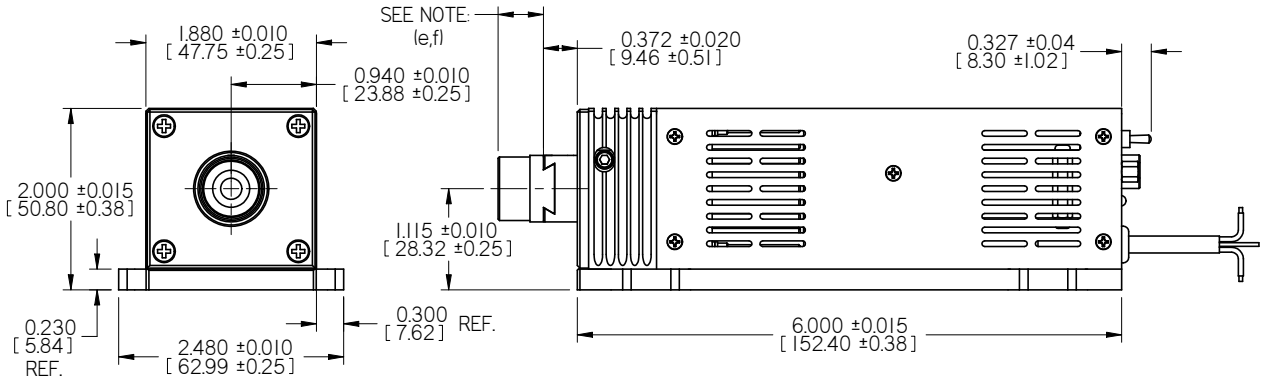
Lasiris PowerLine

Compact, High Power Laser Line Generator

Mechanical Specifications

Top View





Front View

Side View

Lasiris PowerLine

Compact, High Power Laser Line Generator

Key Features

- High power laser in a compact package
- Uniform intensity distribution for laser line generators
- Focusable
- High pointing stability
- Over-voltage, reverse-polarity, over-heating and ESD protection
- Compatible with standard pattern generators

Ordering Information

For all PowerLine series, the warranty period shall be one (1) year. To order, use the following code: **MODEL-(Fast/Slow axis)(Pattern)-(Interbeam Angle)-(Wavelength)(Electronic Option)-Power-Fan Angle-Custom Options**. E.g., **PL-501L-670T-500-45°**. Note that the projected fan angle may be less than the lens fan angle.

	PowerLine UV	PowerLine Violet	PowerLine Blue	PowerLine Red	PowerLine IR
Wavelength[1] (nm)	375	405	445	670	810
Diode Power (mW)	150	600	500	500	1000, 2000
Beam Power (mW)	112	450	375	375	750, 1500
Electrical Power	12/24VDC, 3A[2]	12/24VDC, 3A[2]	12/24VDC, 3A[2]	5VDC, 2A[2]	5VDC, 3A, 4A[2]
Lens Fan Angle	10°, 15°, 20°, 30°, 40°, 45°, 55°, 60°, 75°, custom				

[1] ±10 nm.
[2] At ambient temperature of 23°C.

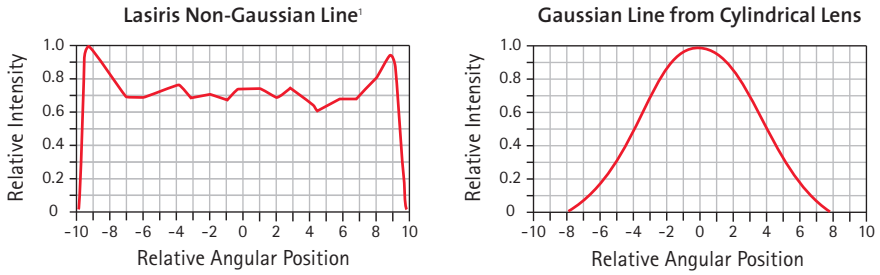
Lasiris PowerLine

Compact, High Power Laser Line Generator

Uniform Intensity

Conventional laser line patterns are often generated by cylindrical optics that produce a Gaussian line profile with a bright center and fading ends. Lasiris patented beam shaping optics spread the light into an evenly illuminated line. The result is a crisp, uniform line with sharp ends.

Line Intensity Profile Along Line Length

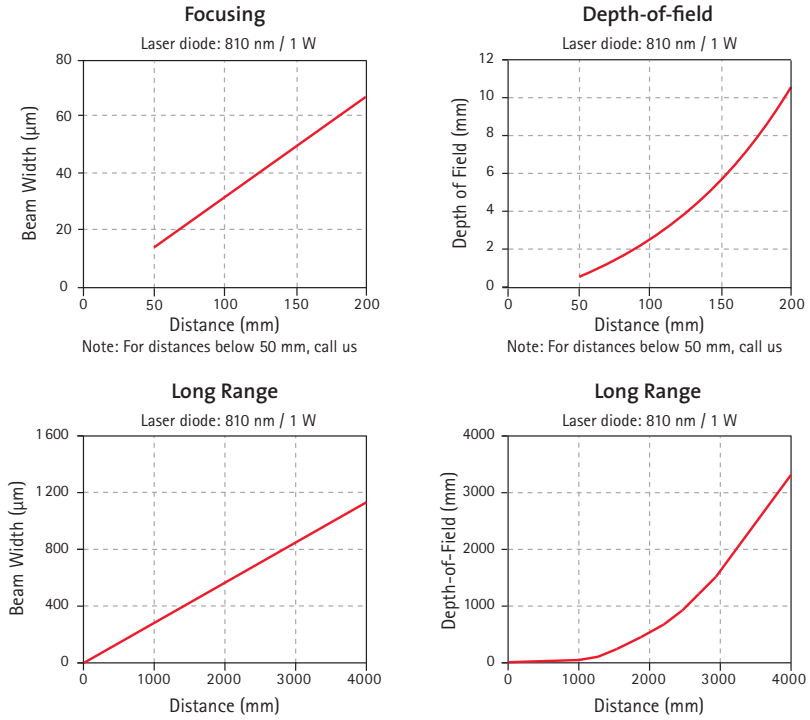


Relative Intensity vs. Angular Position Along Line Length

Focusing Performance

The following figures show the typical focusing and depth-of-field performance (at $1/e^2$) performance. Lasiris PowerLine lasers are focusable and can be adjusted by the user to produce a focused line at any projection distance. In addition, the line can be collimated so that its thickness remains fairly constant over a long projection distance.

Focusing and Depth-of-Field Performance

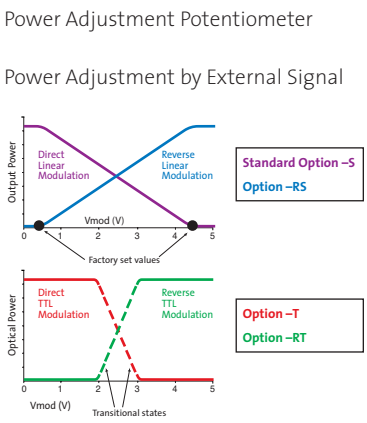


[1] Typical profile.

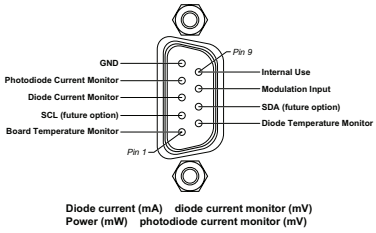
Lasiris PowerLine

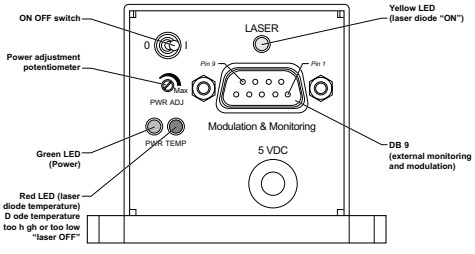
Compact, High Power Laser Line Generator

Optical Specifications	Wavelength ±10 (nm)	375, 405, 445, 670, 810, custom
	Output Power (mW)	150 to 2000
	Fan Angles (°)	1 to 120
	Intensity Distribution	Uniform (non-Gaussian) lengthwise, Gaussian widthwise
	Line Thickness (focus)	User adjustable
	Pointing Stability (µrad/°C)	5
	Bore Sighting (mrad)	<3 (collimated)
Environmental Specifications	Operating Temperature (°C)	-20 to +55 for most models
	Storage Temperature (°C)	-40 to +70
	Wavelength Drift	Maximum ±1 nm over entire operating temperature range
Electrical Specifications	Power Supply Voltage (VDC)	5 ±0.5 Options: 12/24 ±0.5 or 110/240 VAC external adapter
	Power Supply Current (A)	3 at ambient temperature 4 maximum
	Built-In Protection	Entire product: ESD, over-voltage, reverse polarity of power supply Laser diode: overheating, over-current
	Laser Diode Operating Temperature (°C)	25 ±0.5 (adjustable in factory)
	Maximum Beam Power	User adjustable (trim potentiometer on the back panel)
	Beam Modulation	External, though a DB-9 connector on the back panel
	Monitoring	Laser temperature, laser current, PD current through DB-9
Options	Power Options	
	Power Adjustment Potentiometer	Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".
	Power Adjustment by External Signal	Standard modulation S (synchro) or RS (reverse synchro): DC to 10 kHz S: Input voltage = 0VDC → laser "ON" RS: Input voltage = 5VDC → laser "ON" T (TTL) or RT (Reverse TTL): DC to 10 kHz Transition 2 to 3 VDC T: Input voltage = 0VDC → laser "ON" RT: Input voltage = 5V → laser "ON" "Fast" Modulation FS (fast synchro), FRS (fast reverse synchro) or FT (fast TTL0, FRT (fast reverse TTL) DC to 300 kHz
	Maximum Frequency (kHz)	10
	Rise/Fall Time (µs)	<10
	No fan for lower electronic noise (up to 40° C without over-heating) Base plate for efficient heat dissipation	
Available Patterns	Single Line 	Parallel Lines



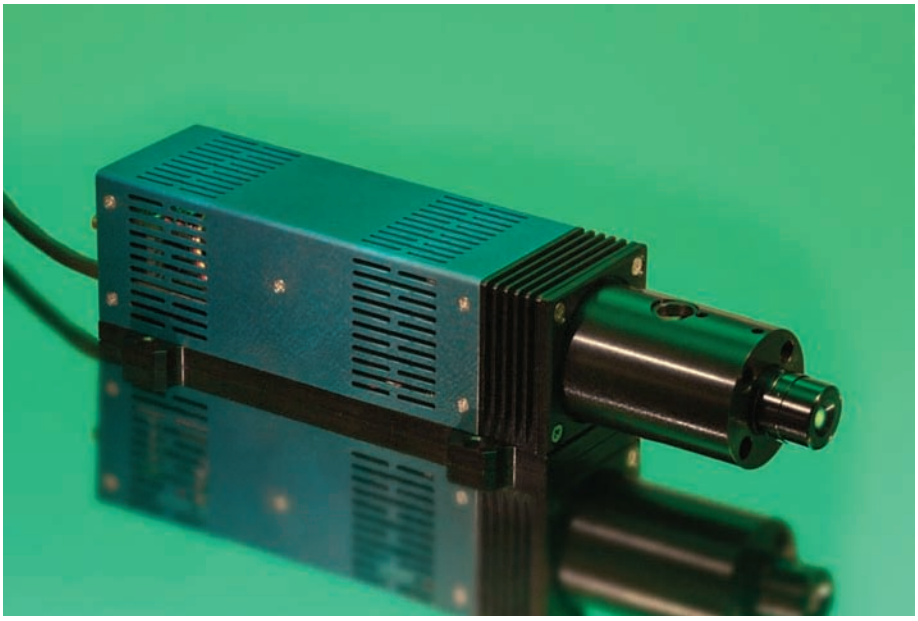
DB-9 Pinout and Back Panel Diagram



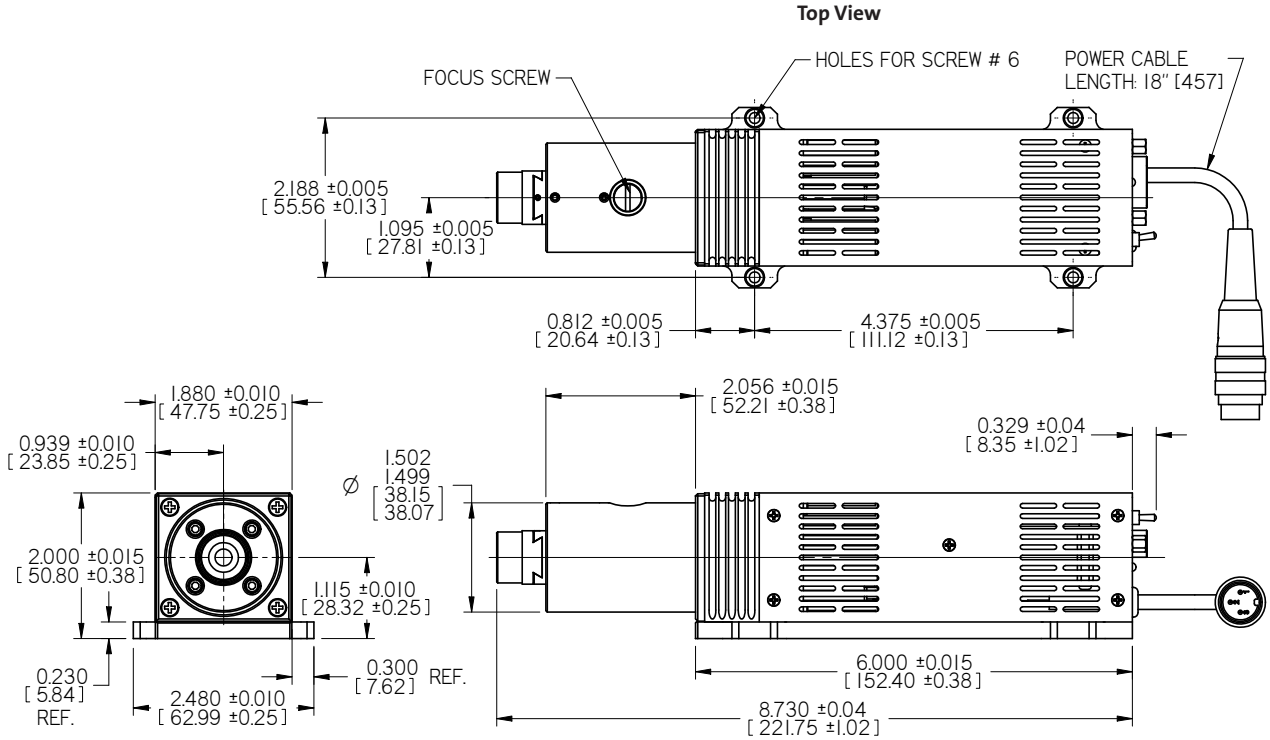

ON OFF switch
Power adjustment potentiometer
Green LED (Power)
Red LED (laser diode temperature) D ode temperature too h gh or too low "laser OFF"
LASER
Yellow LED (laser diode "ON")
PWR ADJ
PWR TEMP
Modulation & Monitoring
5 VDC
DB 9 (external monitoring and modulation)

Lasiris Green PowerLine

Thermoelectrically Cooled Green Laser



Mechanical Specifications



Lasiris Green PowerLine

Thermoelectrically Cooled Green Laser

Key Features

- High power, high visibility, high contrast laser
- External focusing
- Uniform, non-Gaussian intensity distribution along the line
- ESD, over-temperature, and reverse-polarity protection

Ordering Information

Green PowerLine lasers are covered under a one-year warranty (parts and labor). **MODEL-(Fast/Slow axis)(Pattern)-(Interbeam Angle)-("532" for Wavelength)(Electronic Option)-Power-Fan Angle-Custom Options**. E.g., **GPL- 503L(1.2°)-532-100-5°**. Contact us for more details.

	501L or 501D	501H	503L or 503D	505L or 505D	509L or 509D
Pattern	1 line or 1 dot	crosshair	3 lines or 3 dots	5 lines or 5 dots	9 lines or 9 dots
Interbeam Angle[1]	-	-	1.2°, 3.95°·, 9.23°	0.18°, 1.23°	0.09°, 0.06°
Diode Power (mW)	50, 100, 150, 200				
Fan Angle	1°[2], 5°, 10°, 15°, 20°, 30°, 45°, 60°, 75°, custom[3]				

	511L or 511D	515L or 5151D	519L or 519D	533L or 533D	599L or 599D
Pattern	11 lines or 11 dots	15 lines or 15 dots	19 lines or 19 dots	33 lines or 33 dots	99 lines or 99 dots
Interbeam Angle[1]	1.2°	1.8°	0.61°	0.07°, 0.30°	0.118°
Diode Power (mW)	50, 100, 150, 200				
Fan Angle	1°[2], 5°, 10°, 15°, 20°, 30°, 45°, 60°, 75°, custom[3]				

[1] At 532 nm.
[2] Not standard for crosshair projectors.
[3] Custom (please call us).

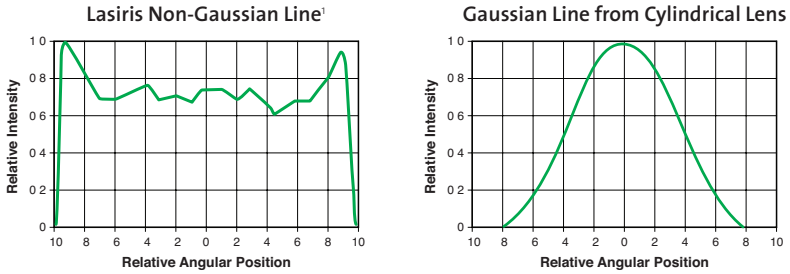
Lasiris Green PowerLine

Thermoelectrically Cooled Green Laser

Uniform Intensity

Laser line patterns are often generated by cylindrical optics that produce a Gaussian line profile with a bright center and fading ends. Lasiris patented optics spread the light into an evenly illuminated line. The result is a crisp, uniform line with sharp ends.

Line Intensity Profile Along Line Length

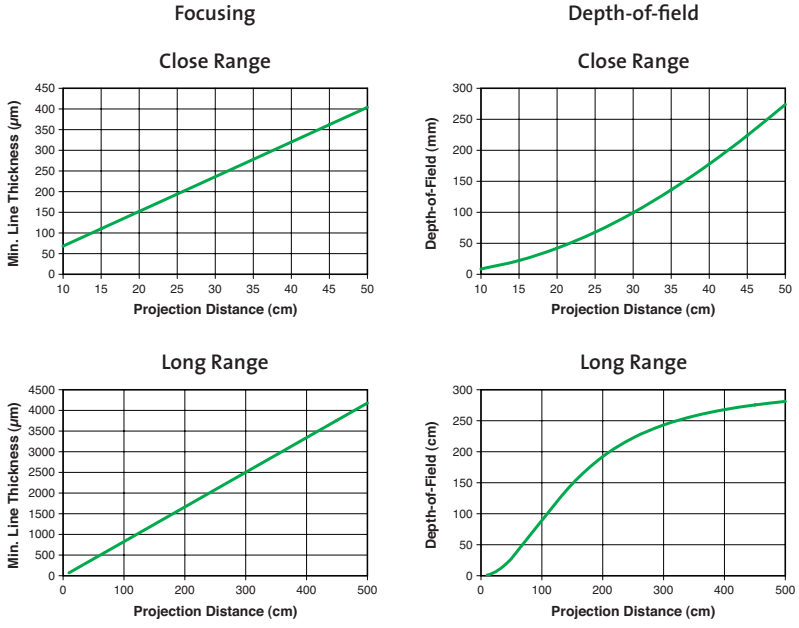


Relative Intensity vs. Angular Position Along Line Length

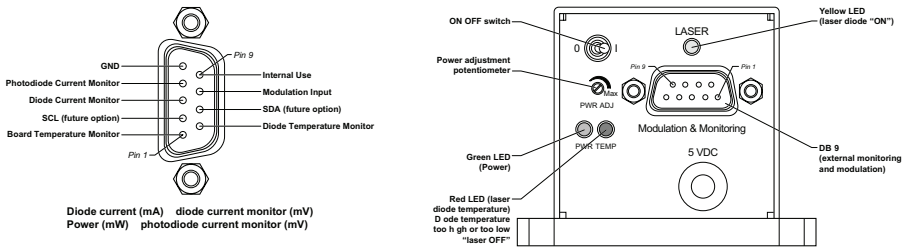
Focusing Performance

The following figures show the typical focusing and depth-of-field performance of the Green PowerLine Laser. The focus charts indicate the minimum line thickness (at 1/e²) achievable for a specific projection distance. The depth-of-field is defined as twice the distance over which the thickness of the line has increased by a factor of √2.

Focusing and Depth-of-Field Performance



DB-9 Pinout and Back Panel Diagram

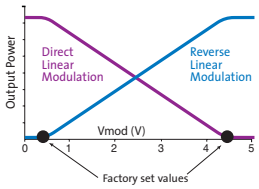


[1] Typical profile.

Lasiris Green PowerLine

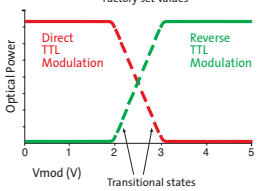
Thermoelectrically Cooled Green Laser

Optical Specifications	Wavelength	532
	Output Power (mW)	50, 100
	Intensity Uniformity	30% uniformity over 80% of the pattern
	Mode	TEM00 (Gaussian profile)
	Polarization Ratio (typical)	4:1
	Line Thickness (focus)	See focusing charts
	Bore Sighting (mrad)	<3
Environmental Specifications	Operating Temperature (˚C)	-20 to +45
	Storage Temperature (˚C)	-40 to +70
	Wavelength Drift	Maximum ±1 nm over entire operating temperature range
Electrical Specifications	Power Supply Voltage (VDC)	5 ±0.5 Adapter is available to supply the unit from 110/240 VAC line
	Power Supply Current (A)	3 at ambient temperature 4 maximum
	Built-In Protection	Entire product: ESD, over-voltage, reverse polarity of power supply Laser diode: overheating, over-current
	Laser Diode Operating Temperature (°C)	25 ±0.5 (adjustable in factory)
	Maximum Beam Power	User adjustable (trim potentiometer on the back panel)
	Beam Modulation	External, though a DB-9 connector on the back panel
	Monitoring	Laser temperature, laser current, PD current through DB-9
Options	Power Options	
	Power Adjustment Potentiometer	Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".
	Power Adjustment by External Signal	



Standard Option –S
Option –RS

Standard modulation
S (synchro) or RS (reverse synchro): DC to 10 kHz
S: Input voltage = 0VDC → laser "ON"
RS: Input voltage = 5VDC → laser "ON"



Option –T
Option –RT

T (TTL) or RT (Reverse TTL): DC to 10 kHz
Transition 2 to 3 VDC
T: Input voltage = 0VDC → laser "ON"
RT: Input voltage = 5V → laser "ON"

"Fast" Modulation
FS (fast synchro), FRS (fast reverse synchro) or
FT (fast TTLo, FRT (fast reverse TTL)
DC to 300 kHz

	Pulsed Modulation Available for both options	
	Maximum Frequency (kHz)	<100
	Rise/Fall Time (µs)	<1
	High Polarization Ratio	100:1
	Separate Driver	Optional

Available Patterns

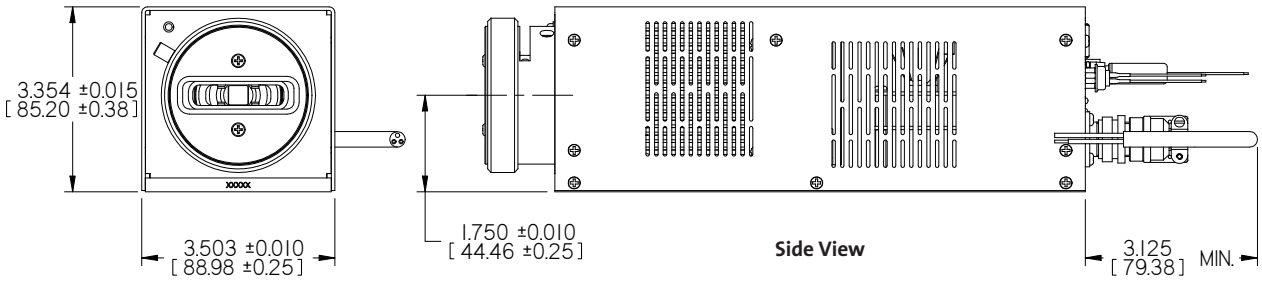
Single Line — Crosshair — Parallel Lines — Single Square

Single Dot — Dot Line — 7x7 Dot Matrix

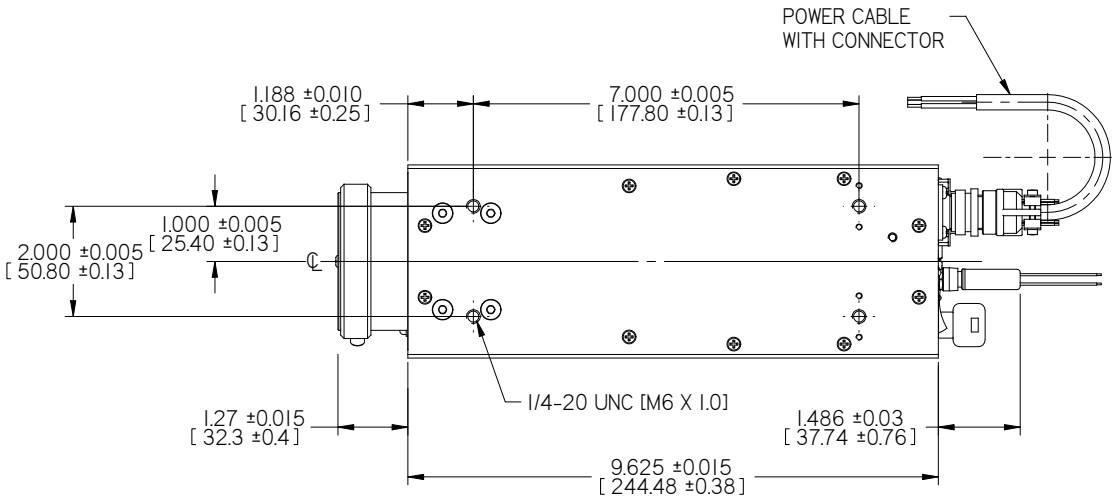
Lasiris Magnum II

High Power Laser Line Generator

Mechanical Specifications



Front View **Side View**



Top View

Lasiris Magnum II

High Power Laser Line Generator

Key Features

- Uniform, non-Gaussian intensity distribution along the line
- Power to 7W
- Wide range of powers and fan angles
- High pointing stability
- Focusable
- Protection against over-voltage, reverse polarity of power supply, overheating and ESD
- Rugged, industrial-grade design

Ordering Information

For all Magnum series, the warranty period shall be four thousand (4000) hours or one (1) year (whichever comes first) for the laser diode chip and one (1) year for the electronic, optical, and mechanical components. To order, use the following code: **MODEL-Wavelength(Electronic Option)-Power-Fan Angle**. Add –100K after the Pulsing Option code for high-speed frequency (100 KHz). See Modulation Graphs for definitions. Add –SD to product code for the separate driver option (e.g., **MAG2-810S-2000-45**). Note that the projected fan angle may be less than the lens fan angle.

	Magnum 500	Magnum 500	Magnum 1000	Magnum 1500	Magnum 2000
Wavelength[1] (nm)	635	680	680	665	810
Diode Power (mW)	500	500	1000	1500	2000
Beam Power (mW)	400	400	800	1200	1600
Electrical Power	12 VDC, 3A	12 VDC, 3A	12 VDC, 3A	12 VDC, 3A	12VDC, 5A
Lens Fan Angle[2]	10°, 15°, 20°, 30°, 40°, 45°, 55°,60°, 75°, custom				

	Magnum 4000	Magnum 7000
Wavelength[1] (nm)	810	808
Diode Power (mW)	4000	7000
Beam Power (mW)	3200	5600
Electrical Power	12 VDC, 5A	12 VDC, 5A
Lens Fan Angle[2]	10°, 15°, 20°, 30°, 40°, 45°, 55°,60°, 75°, custom	

[1] ±10 nm.
[2] 10° and 15° not available on 4000 mW and 7000 mW models.

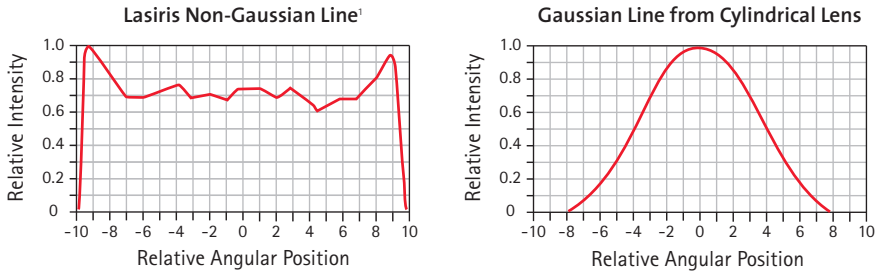
Lasiris Magnum II

High Power Laser Line Generator

Uniform Intensity

Conventional laser line patterns are often generated by cylindrical optics that produce a Gaussian line profile with a bright center and fading ends. Lasiris patented beam shaping optics spread the light into an evenly illuminated line. The result is a crisp, uniform line with sharp ends.

Line Intensity Profile Along Line Length

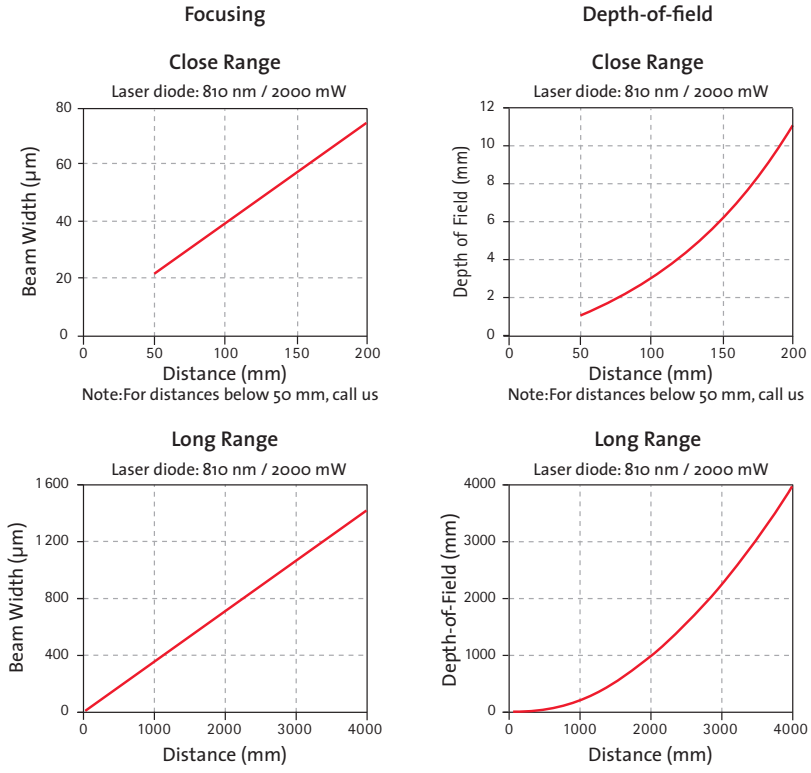


Relative Intensity vs. Angular Position Along Line Length

Focusing Performance

The following figures show the typical focusing and depth-of-field performance (at 1/e²). Lasiris Magnum II lasers are focusable and can be adjusted by the user to produce a focused line at any projection distance. In addition, the line can be collimated so that its thickness remains fairly constant over a long projection distance.

Focusing and Depth-of-Field Performance



[1] Typical profile.

Lasiris Magnum II

High Power Laser Line Generator

Optical Specifications	Wavelength (nm)	635, 665, 680, 808, 810, custom
	Output Power (mW)	500 to 7000
	Intensity Distribution	Uniform (non-Gaussian) lengthwise, Gaussian widthwise
	Fan Angles[1] (°)	10, 15, 20, 30, 40, 45, 55, 60, 75
	Line Thickness (focus)	User adjustable
	Noise (%)	<1 at ambient temperature (Max. RMS variation)
	Power Stability (%)	<3 at ambient temperature (Max. variation in 24 hrs)
	Pointing Stability (µrad/°C)	10
	Bore Sighting (mrad)	<3 (collimated)
Environmental Specifications	Operating Temperature (°C)	-35 to +50 for most models
	Storage Temperature (°C)	-40 to 60
	Wavelength Drift	Maximum ±1 nm over entire operating temperature range
Electrical Specifications	Power Supply Voltage (VDC)	12 ±0.5 An adapter is available to supply the unit from 110/240 VAC line
	Power Supply Current (A)	3 to 5 depending on laser power
	Built-In Protection	Entire product: ESD, over-voltage up to 20V, reverse polarity of power supply. Laser diode: overheating, over-current
	Laser Diode Operating Temperature (°C)	25 ±1 (adjusted in factory)
	Maximum Beam Power	User adjustable (trim potentiometer on the back panel)
	Beam Modulation	External, through a DB-9 connector on the back panel
	Input Impedance (kΩ)	1
	Monitoring	Laser temperature, laser current, PD current through DB-9

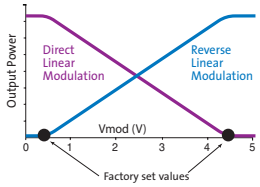
Options

Power Options

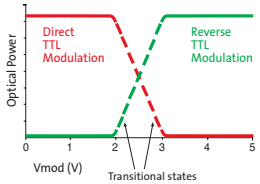
Power Adjustment Potentiometer

Laser power can be easily changed by adjusting an optional built-in potentiometer with a small screwdriver. Code "P".

Power Adjustment by External Signal



Standard Option –S
Option –RS



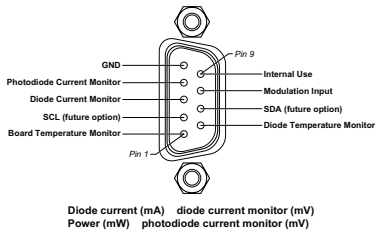
Option –T
Option –RT

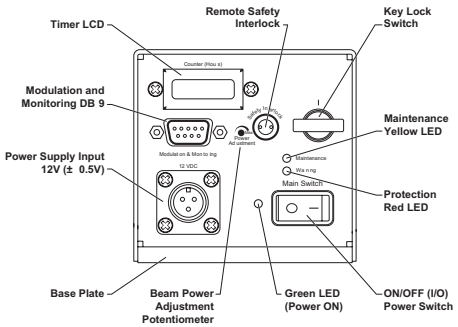
Standard modulation
S (synchro) or RS (reverse synchro): DC to 10 kHz
S: Input voltage = 0VDC → laser "ON"
RS: Input voltage = 5VDC → laser "ON"

T (TTL) or RT (Reverse TTL): DC to 10 kHz
Transition 2 to 3 VDC
T: Input voltage = 0VDC → laser "ON"
RT: Input voltage = 5V → laser "ON"

"Fast" Modulation
FS (fast synchro), FRS (fast reverse synchro) or
FT (fast TTLo, FRT (fast reverse TTL)
DC to 300 kHz

DB-9 Pinout and Back Panel Diagram





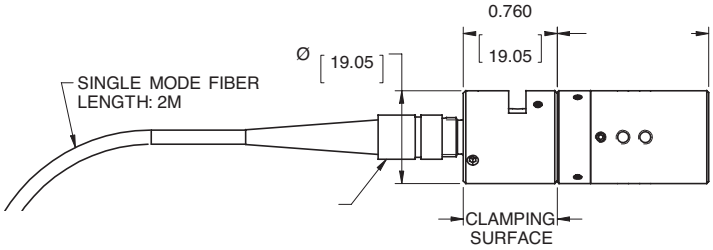
Lasiris Flat Top Projector

Gaussian to Flat Top Using Refractive Beam Shaping Optics

Mechanical Specifications

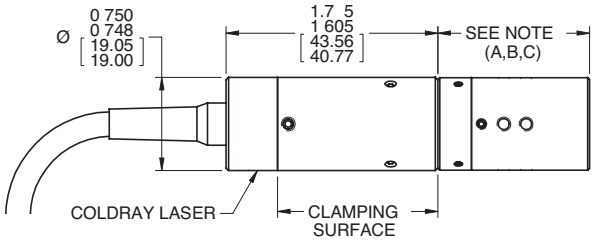
PureBeam/Fiber Option

Side View

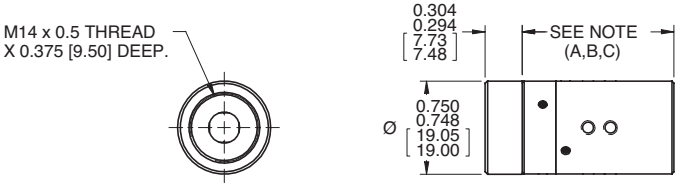


ColdRay Laser Option

Side View



Free Space Option



Front View **Side View**

Lasiris Flat Top Projector

Gaussian to Flat Top Using Refractive Beam Shaping Optics

Key Features

- Very efficient all glass optics
- Achromatic (from UV to near IR)
- Very smooth low ripple uniformity profile with no high frequency noise
- Uniformity coefficient of variation of better than 1% achievable
- High aspect ratios available off the shelf
- High uniformity edge steepness

Ordering Information

To order, use the following code: **BSO-MODEL-Wavelength-POWER-Type-FT Size-WD** (Note: Size in degrees for DFT; size in µm for FFT; size in mm for WD). E.g., **BSO-FS-660-60-DFT-1x3** (Free Space for 660 nm 60 mW Diverging with a FT size of 1 x 3 degrees). E.g., **BSO-CR-660-60-FFT-300x900-100** (ColdRay for 660 nm 60 mW Focusing with a FT size of 300 x 900 µm at 100 mm).

Input Type		
	ColdRay Laser Option	Coherent TEC direct semiconductor free space laser Order code: CR - Wavelength - Power E.g., CR-640-80)
	Free Space Option	M14 threaded holder. Requires input beam dimension (IBD): 0.5 mm up to 4 mm Gaussian at $1/e^2$ Order code: FS-IBD (E.g., FS-4)
	Fiber Option	FC/PC input end, 2 m shielded, NA: 0.12, FC/APC exit end. Requires operating wavelength between 405-830 nm Order code: FIB - Wavelength (E.g., FIB-640)
Flat Top Type		
	One Dimensional Diverging Flat Top	Order code: 1DDFT - Divergence (E.g., 1DDFT-0.3°)
	Two Dimensional Diverging Flat Top	Order code: 2DDFT - Divergence 1 x Divergence 2 (E.g., 2DDFT-0.3°x2°)
	Imaged Flat Top	Order code: FFT - Divergence 1 x Divergence 2 - Focal Length (E.g., FFT-0.3°x02° - F50)
Beam Splitter Type		Order code: Number of beams - Period (E.g., 19B-50 µm)

Lasiris Flat Top Projector

Gaussian to Flat Top Using Refractive Beam Shaping Optics

Flat Top Options

The flat top is a diverging optical element that provides a uniform intensity profile in the far field. It can be imaged or offered simply as a diverging optical element.

Being cylinder based, it can be readily offered acting on only one axis or crossed pairs creating the desired aspect ratio for your application.

The dimension of the flat top at the focal plane of an imaging lens, f, is directly proportional to its effective focal length and can be calculated by:

$$\text{FTS (flat top size)} = 2 * \tan\left(\frac{DIVERGENCE}{2}\right) * f$$

The flat top can be further enhanced by adding Coherent's series of binary phase beam splitters to create a complex array of flat tops. The beam splitters are highly stable binary masters etched directly in fused silica offering very low stray light. They have excellent beam to beam uniformity and have efficiencies in the order of 80%.

Divergences[1] (± 10%)	0.2, 0.3, 0.6, 1, 2, 3, 5, 8, 10, 15, 20, 30
Focal Length[2]	14, 17.5, 20, 25, 30, 35, 40, 45, 50, 60, 75, 80, 90, 100

Gratings for Beam Splitting Option

Complex flat top patterns can be achieved using our beam splitting option.

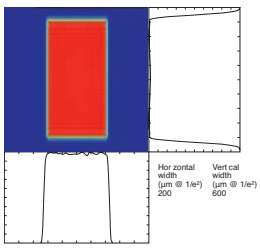
The angle between each beam is operating wavelength dependent and can be found via the grating formula:
d sin θ=n l (d=period in um, θ angle in degrees, n = diffraction order, 0, +/-1, +/- 2, ...)

2 Beams[3] (µm)	3.33, 7.77, 26.3, 338.6
3 Beams (µm)	3.33, 7.77, 26.3, 338.6
5 Beams (µm)	25, 169
9 Beams (µm)	338.2, 532
11 Beams (µm)	25.7
15 Beams (µm)	16.4
19 Beams (µm)	50
33 Beams (µm)	110, 426.1
99 Beams (µm)	260

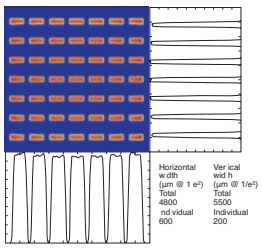
[1] Available divergences for one and two dimensional diverging flat tops.
[2] Available focal lengths for the imaged flat tops otion (l >400 nm) . Working distance will be a few mm shorter.
[3] Zero order minimized.

Flat Top Generators

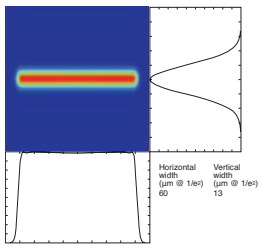
Flat Top 2D



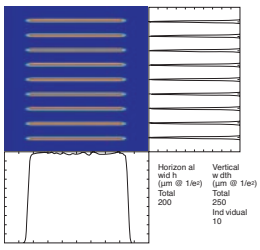
Flat Top Matrix 2D



Flat Top 1D



Flat Top Matrix 1D



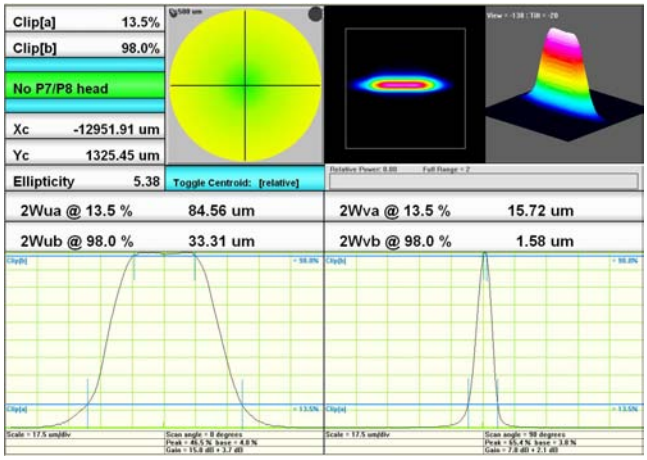
Lasiris Flat Top Projector

Gaussian to Flat Top Using Refractive Beam Shaping Optics

Flow Cytometry Option

Coherent has been very successful in promoting its flat top for flow cytometry applications. Our standard flow cytometry option is available with the following specifications:

Working Distance (mm)	45
Flat Top Dimension (um at 1/e²)	60
Gaussian Dimension (um at 1/e²)	10
Contained Power (%)	>60
CV Uniformity (%)	<1 fiber coupled, <1.5 free space



Input Beam Characteristics

Dimensions[1] (mm)	0.5 to 4
Wavelength[2] (nm)	400 to 1200
Gaussian Fit (%)	97
Mode	TEM00
Divergence	Collimated/Quasi collimated

Output Flat Top Characteristics

High Efficiency 1 Dimensional Flat Top Uniformity	Contained power typical >85%
High Uniformity 1 Dimensional Flat Top Uniformity	CV uniformity typical <5%, down to <1% possible
2 Dimensional Flat Top	CV uniformity <±20%, contained power >85%
Transmission Diverging Flat Top	Contained power >95%
Transmission Focused Flat Top	Contained power >90%

[1] Specified to within 5%, larger input beam available.
[2] Other wavelengths available.

Interference Filters

Technical Specifications

Transmission at Laser Line (%)	80, minimum (85, typical)
Out of Band Transmission (%)	0.001 (50 db attenuation)
Spectral Range	X-Ray to 1150 nm
Effective Index	2.1
Operating Temperature	-20°C to +80°C (-4°F to +176°F)
Humidity Resistance	Minimum 40 Cycles (MIL-STD-810E) Method 507 Procedure 1
Dimension (mm)	25.4 (24.4 mm without ring)
Useable Aperture (mm)	23 ±0.4
Thickness (mm)	4 ±0.25 (3 mm without ring)
Available Band Pass (at FWHM)	20 nm (0 to 15° angle of incidence) 40 nm (0 to 25° angle of incidence) 70 nm (0 to 35° angle of incidence)
Available Center Wavelengths (nm)	532, 635, 660, 670, 680, 685, 780, 810, 830
Bandwidth Tolerances (nm)	20 ±2 40 ±8 70 ±14
Center Wavelength Tolerances (dependent on bandwidth)	+2/-2 +5/-5 +10/-10

Interference Filters

Key Features

- 80% peak transmission
- Non-hydroscopic
- Wide bandwidth

Angle of Incidence and Blue Shifting

The center wavelength of the filter will shift toward shorter (blue) wavelengths as the angle of incidence increases; the greater the angle the greater the shift (see % shift vs. angle of incidence graph). This is known as blue shifting. The amount of blue shift may be calculated using the following formula:

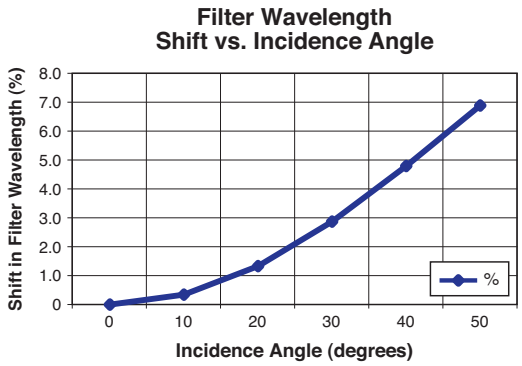
$$\lambda_1 = \lambda_O (1 - \sin^2\theta/n^2)^{1/2}$$

where θ = angle of incidence

λ_1 = resulting wavelength at angle q

λ_O = central wavelength at normal incidence

n = effective index of the filter



Laser Diode Tolerances

Another aspect to take into account when selecting a filter is laser diode tolerances. Diodes typically have a wavelength tolerance of ±10 nm; this wavelength (measured at room temperature) will increase with temperature increases and decrease with temperature decreases at a rate of 0.25 nm/°C.

Ordering Information

To order a filter, choose the center wavelength and bandwidth from the Specifications on page 1. The order code is:
<center wavelength> CW - <band pass> BP - 25.4-80%
For example: 635CW-20BP-25.4-80%

Diode LabLaser Universal Power Supply

Key Features

- Fully-featured LabLaser 6 VDC power supply
- Variable laser power control
- Keylock, emission delay and remote interlock

The Diode LabLaser™ Universal Power Supply provides a well-regulated 6 VDC, 250 mA output for driving any of the Coherent Diode LabLasers with the additional benefit of variable power control. To vary the output power of the Diode LabLasers which incorporate the Variable Power and Modulation Control circuitry simply adjust the multi-turn knob on the front panel of the 31-1050 power supply. This varies a voltage on the "third wire" connection in the laser cables and the laser power can be smoothly varied between threshold and the rated power. The supply incorporates CDRH safety features (keylock, power-on indicator, 4-6 second emission time delay and remote interlock socket), is CE-marked and meets appropriate UL, CSA, and EN requirements.

This compact (120 x 76 x 48 mm) power supply can be connected to any 90-130 or 180-260 VAC 50/60 Hz supply. There is an IEC 320 input socket and a 1.8 m detachable line cord with plug provided. The output to the laser features an easy connect/disconnect 3-terminal jack socket on the front panel which mates to the male plugs of the cables connected to all Diode LabLasers.

Specifications

31-1050-000	LabLaser Power Supply	Power Supply, LabLaser, 6VDC, 250 mA, Adjustable Power Control for MVP
1057734	Plug, 3.5 mm Stereo	Phono Plug to take Laser Diode Module with leads and add a Power Supply Plug

Universal Diode Laser Module Power Supply

Key Features

- Well-regulated 5VDC output
- Autoranging 90 to 260 VAC IEC input
- Output cable with easy connect/disconnect jack

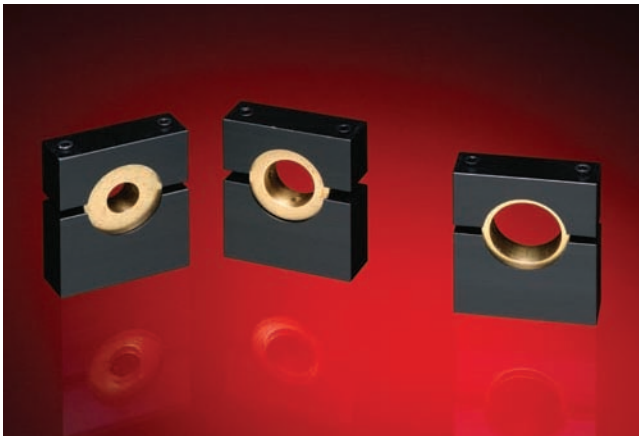
The Universal Diode Laser Module Power Supply uses the latest switchmode technology to provide a well-regulated 5 VDC output suitable for driving any of the Coherent laser diode modules. The supply is CE-marked and meets appropriate UL, CSA, TUV, GS, and FCC requirements.

This compact (75 x 50 x 41 mm) autoranging power module can be connected to any 90-260 VAC 50/60 Hz supply. There is an IEC 320 input socket and a 1.8 m detachable line cord with plug provided. The 1.8 m output cable is terminated with an easy connect/disconnect jack socket which mates to the male plugs connected to all laser modules.

Specifications

31-1001-000	LDM Power Supply	Power Supply, Laser Diode Module, Desk Top, 5VDC , 1.5 amp
1057734	Plug, 3.5 mm Stereo	Phono Plug to take Laser Diode Module with leads and add a Power Supply Plug

Variable Angle Diode Laser Mounts

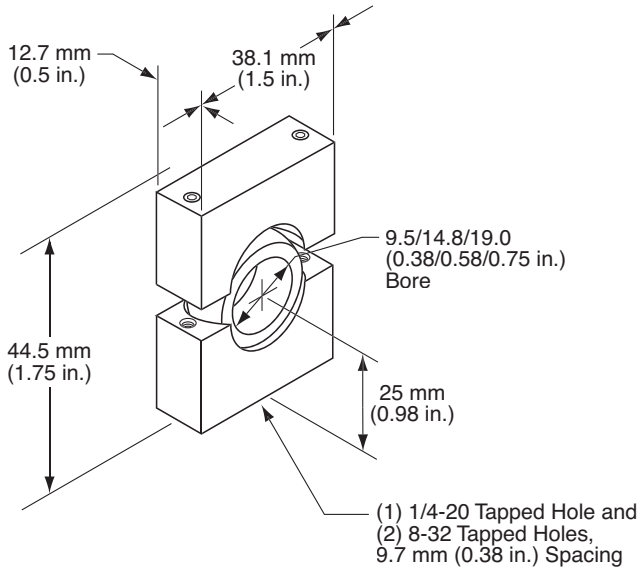


Key Features

- Patent pending
- Simple tip/tilt and lock in place mechanism
- Very affordable
- Adjustable angle through about ±15 degrees

Coherent's variable angle laser diode module mounts are designed to accept three different sizes of diode laser module namely VLM3,VLM2 and LabLasers (9.5 mm, 14.8 mm and 19.0 mm diameter).

This simple mount acts as combined heat sink, electrical insulator and variable-angle mount for 9.5 or 14.8 mm diameter diode modules and 19.0 mm Diode LabLasers. The lasers are held firmly in a spherical-surface brass ring by two small set screws. This ring is clamped between two insulating blocks forming a "ball and socket" arrangement. Two socket-head screws can be loosened to allow easy angular adjustment of the module (±15° range) and quick, rigid locking in position.



Specifications

0221-437-00	Mount for VLM2, FVLM2 or LG2	Variable Angle, 1/4-20 inch Base, 14.8 mm Bore
0221-448-00	Mount for VLM3 or LG3	Variable Angle, 1/4-20 inch Base, 9.5 mm Bore
0221-449-00	Mount, LabLaser/Industrial	Variable Angle, 1/4-20 inch Base, 19 mm Bore

FieldMaxII-TO

Laser Power Meter

Key Features

- Measures laser power from nW to kW
- Works with Thermal and Optical sensors
- Large, bright, backlit LCD display
- Simulated analog-like movement for laser tuning
- Intuitive button-driven user interface
- USB 1.1 interface

FieldMaxII™-TO is an affordable, versatile, easy-to-use digital power meter designed for field service and production test applications. FieldMaxII-TO features a large, easy-to-read backlit LCD and an intuitive user interface offering direct button-driven control for simple operation. To facilitate laser tuning, FieldMaxII-TO provides a fast and responsive tuning feature. Statistics are supported, including min., max., and mean. FieldMaxII-TO is compatible with our thermal and optical sensors. It can measure power from nW to kW.

Specifications	1098579	FieldMaxII-TO	Laser Power Meter

LaserCheck

Handheld Laser Power Meter

Key Features

- Auto-ranging with peak sample-andhold
- Power measurement from 0.5 µW to 1W
- ±5% calibrated accuracy from 400 nm to 1064 nm

LaserCheck™ is a handheld, inexpensive laser power meter specifically designed to provide power measurements in a small, lightweight, self-contained package that can easily be stored in a pocket or tool kit. At higher powers the silicon sensor is protected from saturation with a built-in optical attenuator, and all measurements are displayed on a 3-digit LCD screen. LaserCheck is microprocessor-controlled with wavelength correction, auto-ranging (µW or mW displayed), optical attenuator, power overload warning and automatic shutoff.

Specifications	1098293	LaserCheck	Handheld Laser Power Meter

High-Sensitivity Thermopile Sensors

To 1W

Key Features

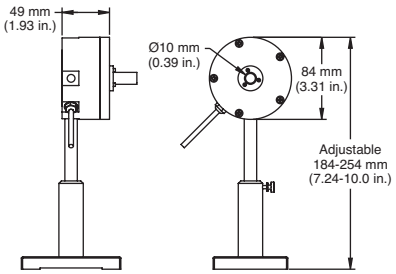
- Thermally stabilized designs
- Broadband 0.3 to 11 µm spectral range
- High resolution to 10 µW
- Large area: 10 and 19 mm diameter
- Fiber-optic connector options

The PS model sensors offer a thermally stabilized, amplified power sensor with a broad spectral response, high sensitivity, and large active area. These sensors are ideal for laser diodes, diode bars and stacks, HeNe, HeCd and small ion lasers. For optimum performance at low power levels we recommend the PS10Q and PS19Q, which utilize quartz windows. PS10 models include a detachable beam tube to block stray light.

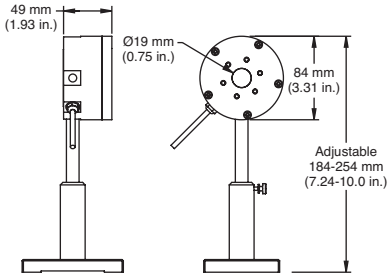
System Specifications

	PS10	PS10Q	PS19	PS19Q
Wavelength Range (µm)	0.3 to 11	0.3 to 2	0.3 to 11	0.3 to 2
Power Range	100 µW to 1W	100 µW to 1W	100 µW to 1W	100 µW to 1W
Resolution (µW)	10	10	10	10
Max. Thermal Drift	40 µW	20 µW	400 µW	20 µW
Max. Avg. Power Density (kW/cm²)	0.5	0.5	0.5	0.5
Max. Pulse Energy Density (mJ/cm², 10 ns pulse)	50	50	50	50
Response Time (sec.)	2	2	2	2
Detector Coating	Black	Black	Black	Black
Quartz Filter Window	-	Yes	-	Yes
Detector Diameter (mm)	10	10	19	19
Dimensions (mm)	Φ 84 x 49	Φ 84 x 49	Φ 84 x 49	Φ 84 x 49
Calibration Uncertainty	±1%	±1%	±1%	±1%
Calibration Wavelength (nm)	514	514	514	514
Cooling Method	Air	Air	Air	Air
Connector Type	PM DB-25	PM DB-25	PM DB-25	PM DB-25
Cable Length (m)	2	2	2	2
Part Number	1098350	1098400	1098413	1098341

PS10/PS10Q



PS19/PS19Q



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